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REPORT NO. CG-B-001-78

FUEL SYSTEM COMPLIANCE GUIDELINE

American Boat and Yacht Council

U.S. Coast Guard Office of Boating Safety
Boating Technical Division
2100 2nd Street SW
Washington, D. C. 20590

January 1978
Final Report

PREPARED FOR
U.S. DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD
WASHINGTON, D.C. 20590

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16. Abstract

The requirements for the fuel system aboard gasoline powered inboard boats are many. Some of these requirements may be specifically applied, but many are dependent on other requirements. Some of the requirements must be complied with only if certain installation conditions are selected or if certain types of fuel system products or components are used. This many faceted approach can easily lead to confusion.

Typically, regulations are written in concise terms, the words and arrangement chosen to be enforceable and in some cases to be legally interpreted. This format prohibits the inclusion of explanations, recommendations and easily detectable alternate solutions. A regulation provides an outline which requires a great deal of further information, interpretation, explanation, clarification and some helpful hints to provide a good understanding necessary for compliance with its intent.

This Fuel System Compliance Guideline attempts to fulfill the needs of the average boatbuilder in achieving compliance with these regulations. It explains, interprets, clarifies, discusses alternates, diagrams, tabulates, makes some recommendations and in general complements the regulations to improve the boat builder's understanding of the requirements.

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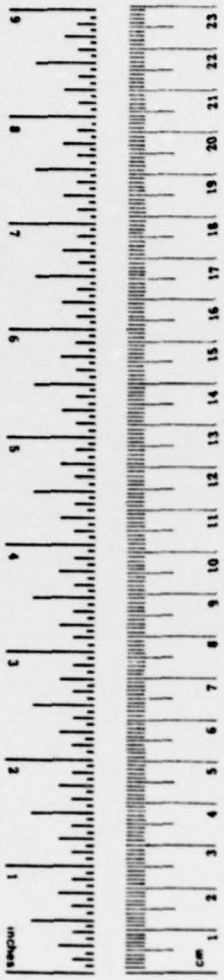
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

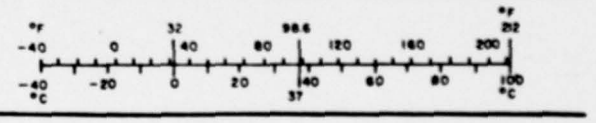
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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3 OCT 1977

FOREWORD

THIS GASOLINE FUEL SYSTEMS COMPLIANCE GUIDELINE WAS PREPARED BY THE AMERICAN BOAT AND YACHT COUNCIL (ABYC), A NON-PROFIT PUBLIC SERVICE ORGANIZATION, UNDER A U. S. COAST GUARD CONTRACT AWARDED TO ABYC PURSUANT TO THE AUTHORITY CONTAINED IN SECTION 25 OF THE FEDERAL BOAT SAFETY ACT OF 1971 (P. L. 92-75).

THIS GUIDELINE DOES NOT DICTATE THE METHODS A MANUFACTURER MUST FOLLOW TO COMPLY WITH THE REGULATIONS, BUT IT IS INTENDED TO BE USED AS A GUIDE TO METHODS WHICH, IF THEY ARE FOLLOWED, WILL BE ACCEPTABLE TO THE COAST GUARD AS MEETING THE INTENT AND PURPOSE OF THE REGULATIONS.

THE MEMBERS OF ABYC HAVE MADE EVERY EFFORT TO MAKE THIS GUIDELINE ACCURATE AND CONSISTENT WITH THE FUEL SYSTEMS REGULATIONS, AND THE COAST GUARD HAS REVIEWED IT FOR ANY INCONSISTENCIES. IN CASES WHERE IT APPEARS THAT A CONFLICT MAY EXIST, HOWEVER, USERS OF THIS GUIDELINE SHOULD ADHERE TO THE REQUIREMENTS OF THE REGULATIONS AND NOT THE SUGGESTED METHODS FOR COMPLIANCE DESCRIBED IN THIS GUIDELINE. ANY QUESTIONS SHOULD BE DIRECTED TO YOUR COAST GUARD DISTRICT BOATING STANDARDS OFFICE.

THE COAST GUARD WISHES TO THANK THE MEMBERS OF ABYC WHO CONTRIBUTED THEIR PERSONAL TIME TO THE DEVELOPMENT OF THIS COMPLIANCE GUIDELINE. THE GUIDELINE WILL AID SMALL VOLUME BOATBUILDERS WHO LACK LARGE ENGINEERING STAFFS AND EXTENSIVE TECHNICAL CAPABILITIES IN COMPLYING WITH THE REGULATIONS. THE RECREATIONAL BOATING PUBLIC WILL SOON REALIZE THE BENEFITS OF THE GASOLINE FUEL SYSTEMS REGULATIONS THROUGH A REDUCTION IN THE INCIDENCE OF FIRES AND EXPLOSIONS ABOARD RECREATIONAL BOATS.

D. F. LAUTH
Rear Admiral, U. S. Coast Guard
Chief, Office of Boating Safety

Dist: (SDL No. 105)
A: None
B: c(5); n(50)
C: None
D: None
E: s(2)
F: None

FUEL SYSTEM COMPLIANCE GUIDELINE

INTRODUCTION

The requirements for the fuel system of gasoline powered inboard boats are many. Some of these requirements may be specifically applied but many are dependent on other requirements. Some of the requirements need be complied with only if certain conditions of installation are selected or if certain type of fuel system products or components are used. This many faceted approach can easily lead to confusion.

Regulations are typically written in concise terms, the words and arrangement chosen to be enforceable and in some cases to be legally interpreted. This format prohibits explanations, recommendations, and easily detected alternate solutions to be included. A regulation provides an outline about which a great deal of further information, interpretation, explanation, clarification and some helpful hints are needed in order to provide a good understanding and compliance with its intent.

This fuel system guideline attempts to fulfill the needs of the average boatbuilder in order to assist in achieving compliance with these regulations. It explains, interprets, clarifies, discusses alternates, diagrams, tabulates, makes some recommendations and in general complements the regulation to improve the boat builder's understanding.

SUMMARY

The format of this guideline has been chosen to follow the sequence of presentation in the fuel system regulation. Obviously other arrangements could have been chosen, however this format provides the many, many boatbuilders and component suppliers, who have followed the development of the regulation, a familiar sequence of information, thereby reducing confusion.

Each portion of the regulation has been stated in a box identified by **ITS THE LAW**. The effective date of this portion of the regulation is stated and then a discussion follows. The discussion; explains, interprets, clarifies, identifies interdependence of requirements and is designed to improve the understanding of the intent of the regulatory requirement. Diagrams are freely used and tables included wherever they can be helpful.

The discussion, diagrams and tables are followed by a box identified by **DO YOU COMPLY**, which asks questions to which the answer must be **YES** if compliance is achieved. This is a checklist for each regulatory requirement.

CONTENTS

INDEX

F

INDEX

INDEX

INDEX

T

U

V

ILLUSTRATIONS

TABLES

GENERAL

APPLICABILITY

DEFINITIONS

GENERAL

IT'S THE LAW

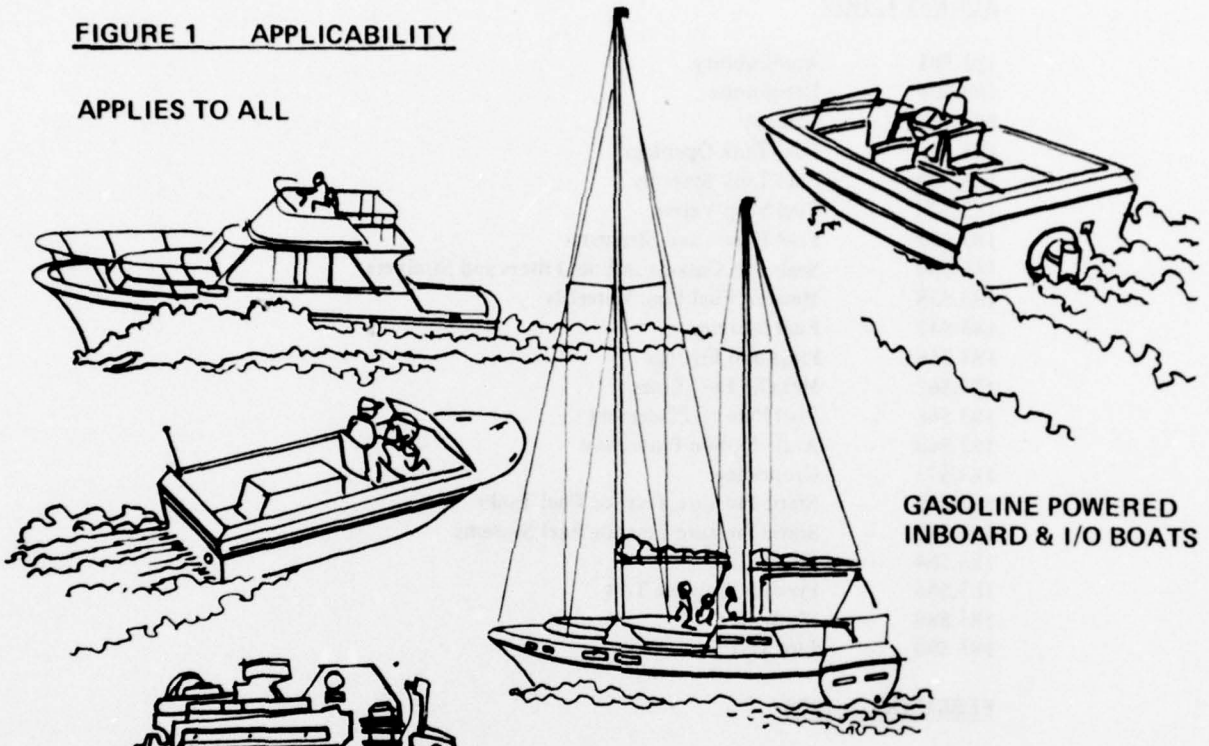
183.501 APPLICABILITY

(a) This subpart applies to all boats that have gasoline engines, except outboard engines, for electrical generation or mechanical power for propulsion.

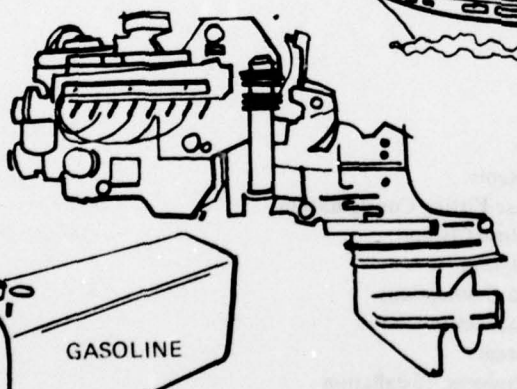
EFFECTIVE DATE: AUGUST 1, 1977

FIGURE 1 APPLICABILITY

APPLIES TO ALL

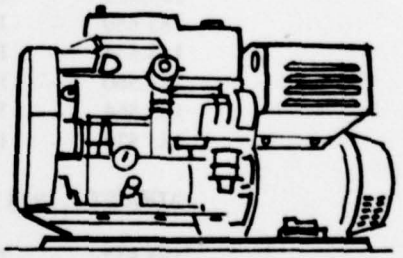


GASOLINE POWERED INBOARD & I/O BOATS



GASOLINE ENGINES FOR INBOARD & I/O BOATS

GASOLINE FUEL TANKS WHICH ARE PERMANENTLY INSTALLED ON INBOARD & I/O BOATS



GASOLINE AUXILIARY ENGINES

NOTE: Each fuel tank or container of 7 gallons or less capacity which is not permanently installed, is exempt.

IT'S THE LAW

183.501 APPLICABILITY

(b) The sections in this subpart are effective on the following dates:

EFFECTIVE DATE: AUGUST 1, 1977

AUGUST 1, 1977

183.501 – Applicability
183.505 – Definitions
183.507 – General
183.518 – Fuel Tank Openings
183.520 – Fuel Tank Systems
183.528 – Fuel Stop Valves
183.534 – Fuel Filters and Strainers
183.536 – Seals and Gaskets in Fuel Filters and Strainers
183.538 – Metallic Fuel Line Materials
183.542 – Fuel Systems
183.556 – Plugs and Fittings
183.562 – Metallic Fuel Lines
183.566 – Fuel Pumps: Placement
183.568 – Anti–Siphon Protection
183.572 – Grounding
183.580 – Static Pressure Test for Fuel Tanks
183.582 – Static Pressure Test for Fuel Systems
183.584 – Shock Test
183.586 – Pressure Impulse Test
183.588 – Slosh Test
183.590 – Fire Test

FEBRUARY 1, 1978

183.510 – Fuel Tanks
183.514 – Fuel Tanks: Labels
183.522 – Fuel Tank Fill Systems
183.530 – Spud, Pipe and Hose Fitting Configuration
183.532 – Clips, Straps and Hose Clamps
183.550 – Fuel Tanks: Installation
183.554 – Fittings, Joints and Connections
183.560 – Hose Clamps: Installation
183.564 – Fuel Tank Fill System
183.570 – Fuel Filters and Strainers: Installation

AUGUST 1, 1978

183.512 – Fuel Tanks: Prohibited Materials
183.516 – Cellular Plastic Used to Encase Fuel Tanks
183.524 – Fuel Pumps
183.526 – Carburetors
183.540 – Hoses: Identification
183.552 – Plastic Encased Fuel Tanks: Installation
183.558 – Hoses and Connections

IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"ASTM" means American Society for Testing and Materials. ASTM standards in this subpart may be examined at Coast Guard Headquarters, Room 4314, Trans Point Building, 2100-2nd Street S.W., Washington, DC 20590 and may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

EFFECTIVE DATE: AUGUST 1, 1977

THE FOLLOWING ASTM STANDARDS ARE REFERENCED IN THIS REGULATION:

ASTM D–471 "Test for Change in Properties for Elastomeric Vulcanizates Resulting from Immersions in Liquids", dated December 18, 1968. Applies to 183.516.

ASTM D–1621 "Test for Compressive Strength of Rigid Cellular Plastics", dated August 31, 1964. Applies to 183.516.

ASTM D–1622 "Apparent Density of Rigid Cellular Plastics", dated September 30, 1963. Applies to 183.516.

IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"Flame arrestor" means a device or assembly that prevents passage of flame through a fuel vent

EFFECTIVE DATE: AUGUST 1, 1977

A flame arrestor for a fuel tank vent may be a specially designed fitting with flame arresting elements, such as screens, or the vent tubing itself may be effective. Air flows in both directions in the fuel tank vent, outside air goes into the tank to equalize the pressure when gasoline is used in the engine and, fuel vapor-laden air flows out of the tank through the vent when the tank is being filled. Ambient temperature changes also cause air flow in both directions. Should the fuel vapor-laden air be ignited outside the fuel tank fittings, or discharge point, the flame arrestor is to prevent the flame from being propagated through the fuel tank vent line into the fuel tank.

If it is intended to qualify a vent system without a specially designed fitting containing flame arresting elements, it is recommended that extreme caution be excerised to assure the safe conduct of any qualifying test.

For fuel tank vent system requirements refer to 183.520, 183.530, 183.532, 183.554, 183.558 and 183.560.

IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"Fuel system" means the entire assembly of the fuel fill, vent, tank, and distribution components, including pumps, valves, strainers, carburetors, and filters.

EFFECTIVE DATE: AUGUST 1, 1977

A typical fuel system is diagramed in Figure 2. Other fuel systems may contain additional or fewer fuel components or may be of other materials as permitted under these regulations. Twin or more engines in a boat will necessitate a more complicated system, which may include a number of fuel tanks with possible provisions for inter-connection. Fuel transfer pumps may also be included in the fuel system.

IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"Military Specification" means a specification developed by the U.S. Armed Forces. Military Specifications in this subpart may be examined at Coast Guard Headquarters, room 4314, Trans Point Building, 2100-2nd Street S.W., Washington DC 20590 and may be obtained from the Commander, Naval Ship Engineering Center, DOD Standardization Program & Documents Branch, Hyattsville, Maryland 20782.

EFFECTIVE DATE: AUGUST 1, 1977

THE FOLLOWING MILITARY SPECIFICATION IS REFERENCED IN THIS REGULATION:

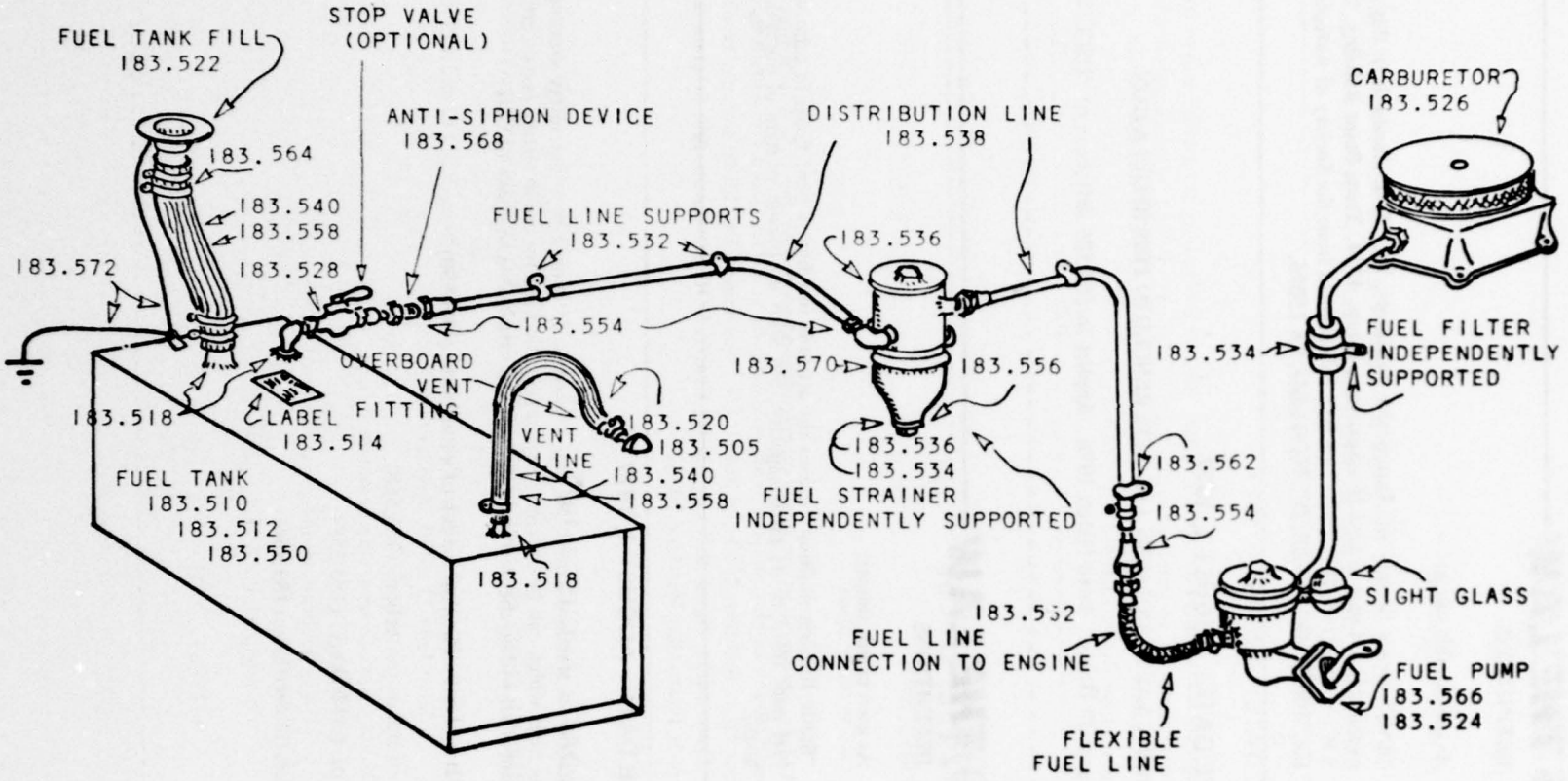
MIL P–21929B Plastic Material, Cellular Polyurethane, Foam-In-Place, Rigid (2 and 4 Pounds Per Cubic Foot), dated June 22, 1970. Applies to 183.516.

A copy of this Military Specification may be obtained from:

Naval Publications and Form Center
5801 Tabor Avenue
Philadelphia, PA 19120

(215) 697–3321

FIGURE 2 - A TYPICAL FUEL SYSTEM



IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"SAE" means Society of Automotive Engineers, Inc. SAE standards in this subpart may be examined at Coast Guard Headquarters, Room 4314, Trans Point Building, 2100-2nd Street S.W., Washington, DC 20590 and may be obtained from the Society of Automotive Engineers, Inc., 400 Commonwealth Dr., Warrendale, PA 15096.

EFFECTIVE DATE: AUGUST 1, 1977

THE FOLLOWING SAE STANDARDS ARE REFERENCED IN THIS REGULATION:

J30C "Fuel and Oil Hoses", dated March 1976. Applies to 183.505 definition of "USCG Type A and B Hoses".

IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"Static floating position" means the attitude in which a boat floats in calm water, with each fuel tank filled to its rated capacity, but with no person or item of portable equipment on board.

EFFECTIVE DATE: AUGUST 1, 1977

This is to establish a standard condition, not related to freeboard or other safety consideration, but to be an attitude of the boat which can be obtained on a repeatable basis for use in testing certain criteria of the regulation. The requirements that will be checked with the boat in a "static floating position" are:

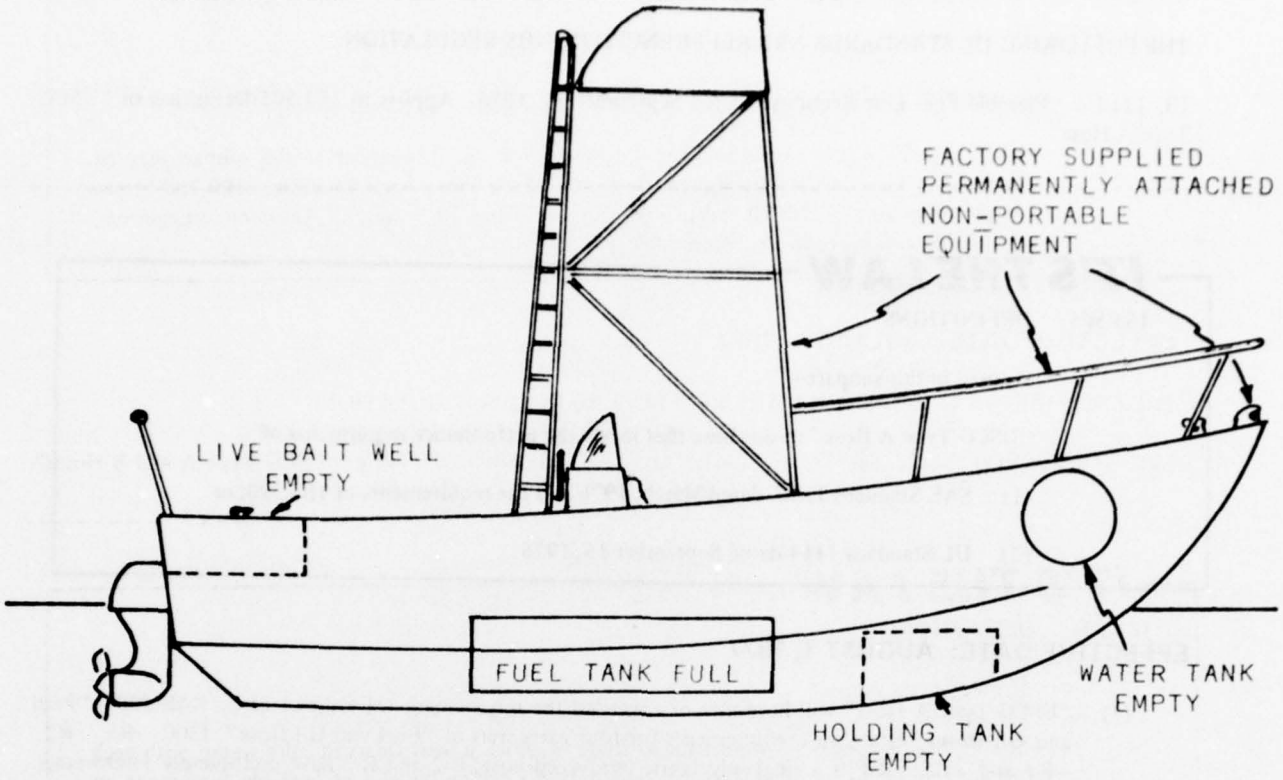
(1) Water accumulation on the top of a fuel tank. (183.550)

(2) Anti-siphon protection. (183.568)

(3) 5 oz. fuel leakage. (183.558)

(4) Fuel fill overflow. (183.564)

FIGURE 3 - STATIC FLOATING POSITION



PORTABLE EQUIPMENT NOT ON BOARD

Examples of portable equipment:

Mattresses, Portable Fire Extinguishers except bracket, Lines, Fenders, P.F.D.'s, Chairs, Tables, Anchors and Chains, etc.

A boat builder should record what equipment the test sample has on board during the test in order that a compliance test may be conducted in the same way.

IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"UL" means Underwriters' Laboratories, Inc. UL standards in this subpart may be examined at Coast Guard Headquarters, Room 4314, Trans Point Building, 2100 – 2nd Street S.W., Washington, DC 20590 and may be obtained from Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago, IL 60611.

EFFECTIVE DATE: AUGUST 1, 1977

THE FOLLOWING UL STANDARDS ARE REFERENCED IN THIS REGULATION:

UL 1114 – "Flexible Fuel Line Sections", dated September 15, 1976. Applies to 183.505 Definition of "USCG Type A Hose".

IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"USCG Type A Hose" means hose that meets the performance requirments of –

(1) SAE Standard J30C, dated March, 1976 and the requirements of 183.590; or

(2) UL Standard 1114 dated September 15, 1976.

EFFECTIVE DATE: AUGUST 1, 1977

(1) "USCG Type A Hose" will have met or exceeded the requirements of either 1 or 2. SAE J30C "Fuel and Oil Hoses" establishes requirements for four categories of "Fuel and Oil Hose", J30C –R1, –R2, –R3 and –R5. R-1 is a single-ply fabric reinforced hose; R-2 and R-3 have multiple-ply reinforcing; R-5 is a wire and fabric reinforced hose. These hoses are qualified by meeting the criteria of a number of performance tests, and in order to be labeled SAE J30C hose, must comply with specified dimensions and construction details. The USCG only requires it to meet the performance requirements of SAE J30C, plus the fire test requirements of 183.590. SAE J30C hose is not by itself qualified for fire resistance ("USCG Type A Hose").

(2) UL 1114 – "Flexible Fuel Line Sections" establishes performance requirements for any type of flexible fuel line and is applied to hoses used for fuel lines. The UL standard includes a fire test and therefore, a UL listed and labeled hose meets the requirements for "USCG Type A Hose".

IT'S THE LAW

183.505 DEFINITIONS

As used in this subpart –

"USCG Type B Hose" means hose that meets the performance requirements of SAE Standard J30C, dated March, 1976.

EFFECTIVE DATE: AUGUST 1, 1977

Any "USCG Type A Hose" may be used in place of a "USCG Type B Hose", as it meets an additional fire resistance requirement than "USCG Type B Hose". Therefore, the SAE J30C type hose which has met the fire test, and the UL 1114 listed and labeled hose may be used where "USCG Type B Hose" is called for in these regulations.

To qualify as a "USCG Type B Hose" it is necessary for the hose to meet the criteria of the performance tests of SAE Standard J30C. The dimensional and construction details specified in the standard need not be met, though if the hose is to be labeled SAE J30C these non-performance requirements must also be met. It is to be noted that there is no fire test requirement for "USCG Type B Hose". For the test procedures and required performance refer to the SAE Standard J30C, dated March 1976.

IT'S THE LAW

183.507 GENERAL

Each fuel system component on a boat to which this subpart applies must meet the requirements of this subpart unless the component is part of an outboard engine or is part of portable equipment.

EFFECTIVE DATE: AUGUST 1, 1977

The boat manufacturer is required to certify his boat as complying with this standard, not the manufacturer of each component. Component parts of outboard engines and portable equipment, such as a self-contained gasoline engine-generator unit, are not covered by these regulations.

The EQUIPMENT STANDARDS of this regulation appear to impose requirements, and consequently certification responsibilities, on component manufacturers. This is not the case. The boat manufacturer is the responsible party under these regulations and he must certify compliance. Purchase orders can stipulate that component manufacturers provide affidavits of compliance which a boat manufacturer may choose to recognize as supporting evidence in certifying the entire fuel system.

EQUIPMENT STANDARDS

FUEL TANKS

FUEL TANK ENCASEMENT

FUEL TANK FILL

FUEL TANK VENT

FUEL PUMPS

CARBURETORS

FUEL STOP VALVES

HOSE FITTINGS

CLIPS, STRAPS AND HOSE CLAMPS

FUEL FILTERS AND STRAINERS

SEALS AND GASKETS

FUEL LINES AND HOSES

IT'S THE LAW

183.510 FUEL TANKS

(a) Each fuel tank in a boat must have been tested by its manufacturer under 183.580 and not leak.

EFFECTIVE DATE: FEBRUARY 1, 1978

EACH fuel tank must be tested to see if it leaks. This leakage test includes any fittings supplied as part of the tank.

TEST PRESSURE – The test pressure must be the greater of at least 3 pounds per square inch gage (PSIG) or 1 1/2 times the pressure created at the lowest point in the fuel system when the fill or vent line, whichever is lower in height, is filled to its top with fuel, as indicated in 183.582. A 3 PSIG test will cover installations whose height from the lowest point in the fuel system is 6.4 ft. to the lower of the fill or vent. See the Graph below for height covered by various pressures. These heights refer to a head of gasoline and takes into account the 1 1/2 times the head. The determined pressure is the minimum pressure that must appear on the fuel tank label. For the test procedure refer to 183.580.

FIGURE 4 FUEL TANK PRESSURE

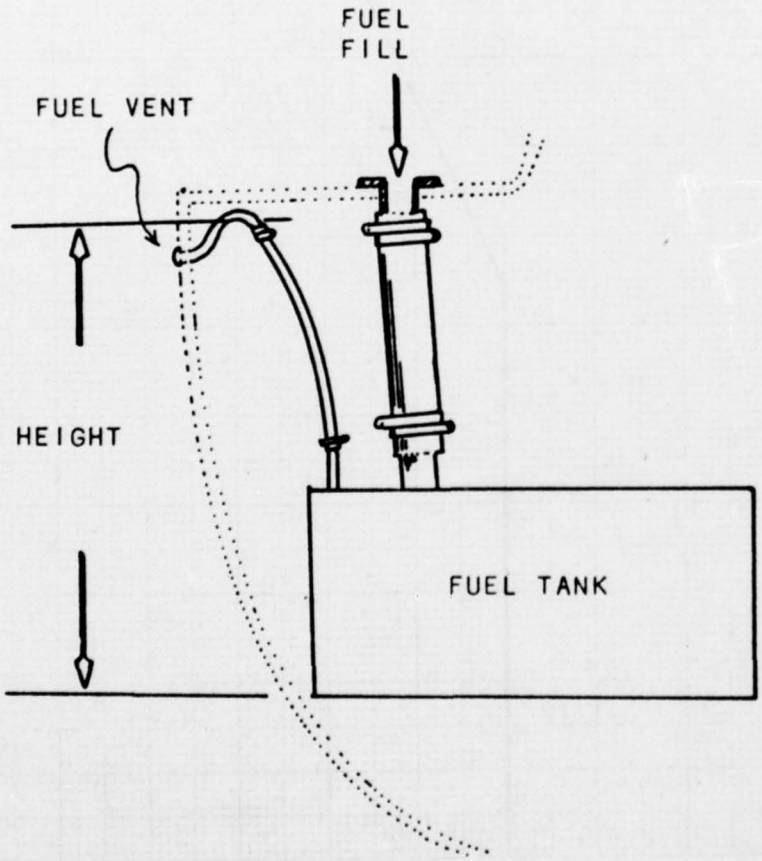
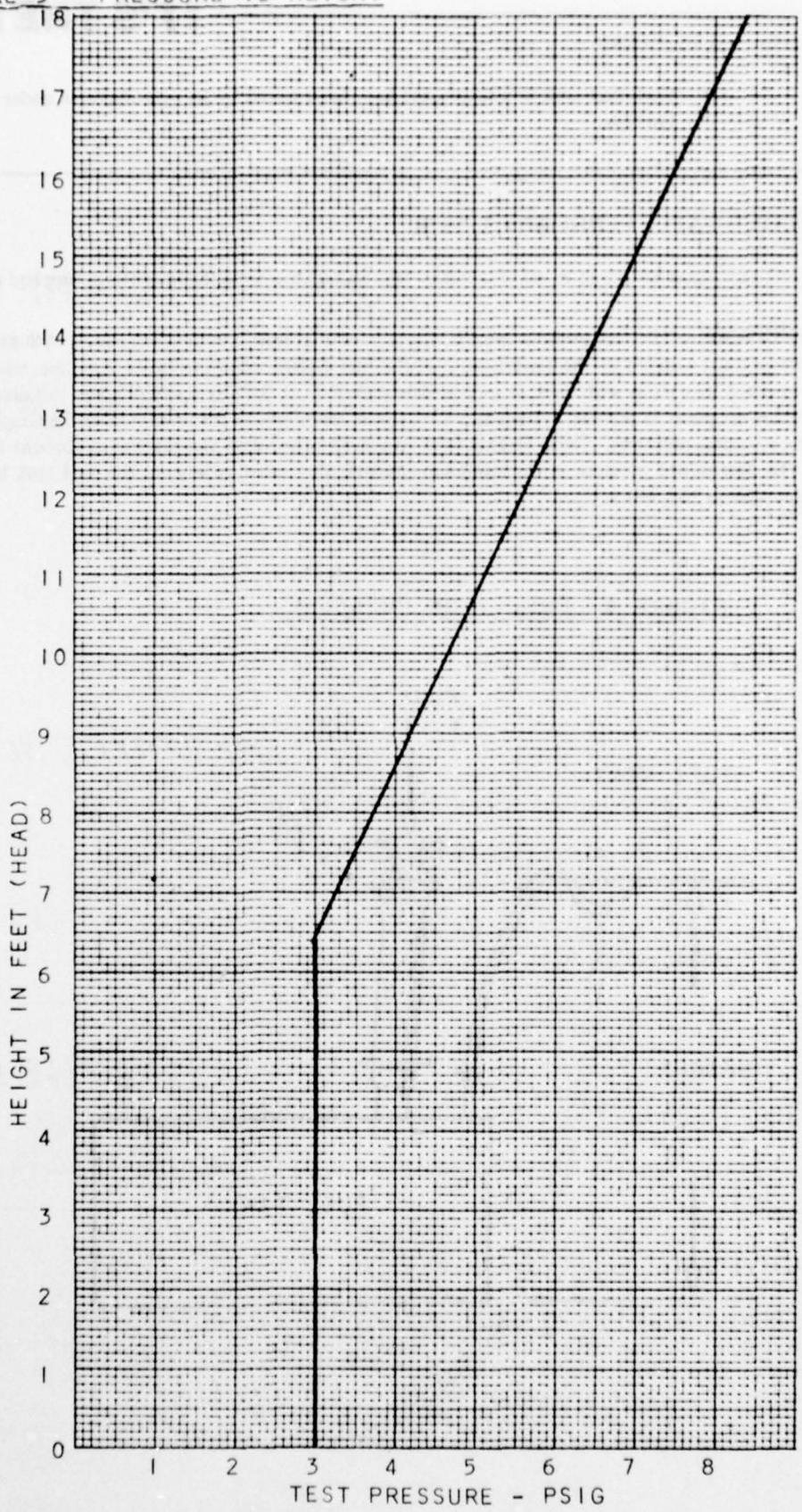


FIGURE 5 - PRESSURE vs HEIGHT



DO YOU COMPLY

Each tank is pressure tested. ( )
Use procedures described in 183.580.
Use pressure marked on tank label.

There are no leaks. ( )

IT'S THE LAW

183.510 FUEL TANKS

(b) Each fuel tank must not leak if subjected to the fire test under 183.590. Leakage is determined by the static pressure test under 183.580, except that the test pressure must be at least one-fourth PSIG.

EFFECTIVE DATE: FEBRUARY 1, 1978

EACH fuel tank must be designed and constructed so that if it is selected to be fire tested according to one of the procedures of 183.590, it will not leak following the fire test when pressure tested to 0.25 PSIG in accordance with the test procedure described in 183.580.

Selection for a fire test may be made by the USCG in order to conduct a compliance check. A manufacturer may also select a representative tank and subject it to a fire test in order to assure compliance.

DO YOU COMPLY

The fuel tank will withstand at least one of the following fire tests:

Fire chamber test – 183.590 (a)(3), (b) & (c) ( )
Actual or simulated hull section – 183.590 (a)(3), (b) & (e) ( )

The fuel tank does not leak following the fire test –
See 183.580 Use 0.25 PSIG ( )

IT'S THE LAW

183.510 FUEL TANKS

(c) Each fuel tank of less than 25 gallons capacity must not leak if tested under 183.584.

EFFECTIVE DATE: FEBRUARY 1, 1978

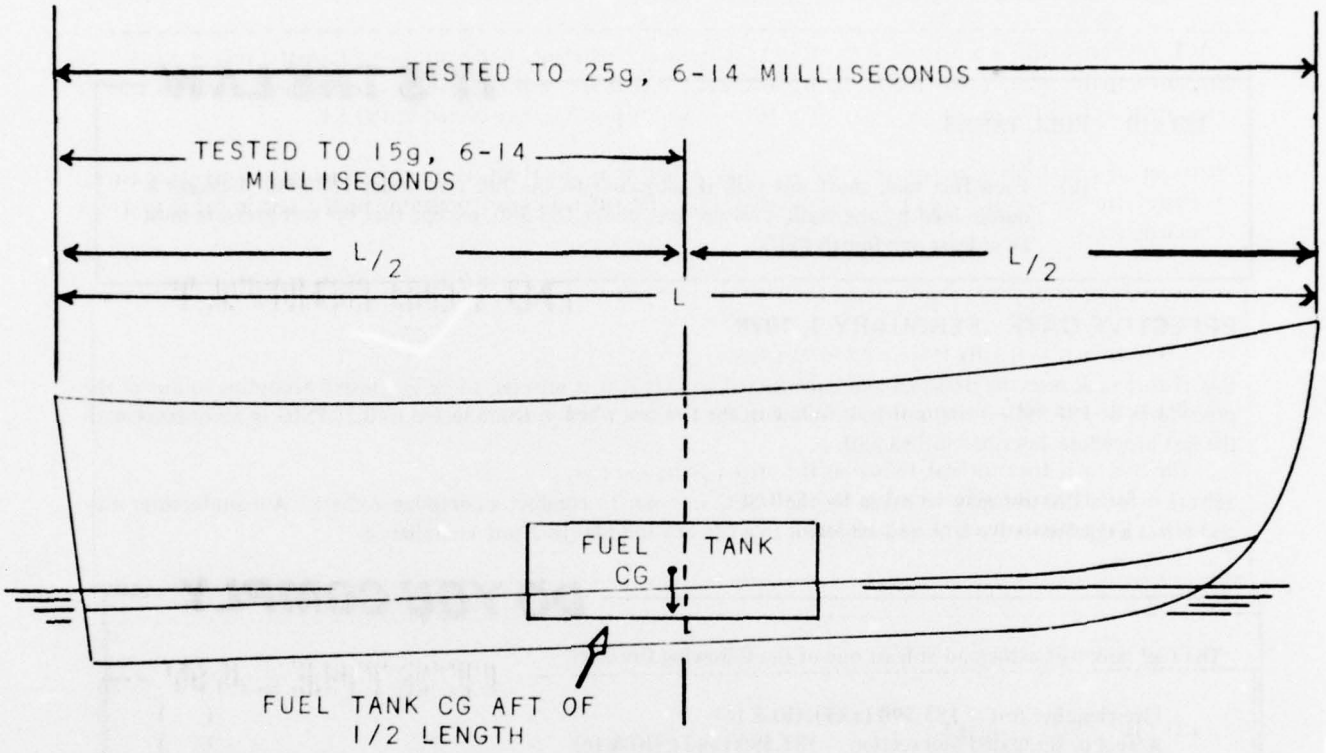
EACH fuel tank less than 25 gallons capacity must be designed and constructed so that if it is selected to be shock tested according to the precedures of 183.584, it will not leak following the shock test when pressure tested to the pressure marked on its label, using the procedure described in 183.580.

Tanks tested at 25g, between 6 and 14 milliseconds duration may be installed anywhere in a boat.

Tanks tested at 15g, between 6 and 14 milliseconds duration must be marked according to 183.514(b)(8):

"Must be installed aft of the boat's half length"

FIGURE 6 - FUEL TANK SHOCK TEST



DO YOU COMPLY

The fuel tank's capacity is less than 25 gallons ( )

The fuel tank will withstand the shock test described in 183.584. ( )

The fuel tank does not leak following the shock test. ( )
Use procedures described in 183.580.
Use pressure marked on the tank label.

IT'S THE LAW

183.510 FUEL TANKS

(d) Each fuel tank with a capacity of 25 to 99 gallons must not leak if tested under 183.586.

EFFECTIVE DATE: FEBRUARY 1, 1978

EACH fuel tank with a capacity of 25 to 99 gallons, must be designed and constructed so that if it is selected to be pressure-impulse tested according to the precedures of 183.586, it will not leak. To determine if it leaks it shall be pressure tested, to the pressure marked on its label, using the procedure described in 183.580.

Selection of a tank for a pressure-impulse test may be made by the USCG in order to conduct a compliance check. A manufacturer may also select a representative tank and subject it to a pressure impulse test in order to assure compliance.

DO YOU COMPLY

The fuel tank's capacity is from 25 to 99 gallons ( )

The fuel tank will withstand the pressure-impulse test described in 183.586. ( )

The fuel tank does not leak following the pressure-impulse test. ( )
Use procedures described in 183.580.
Use pressure marked on tank label.

IT'S THE LAW

183.510 FUEL TANKS

(e) Each fuel tank of 100 gallons capacity or more must not leak if tested under 183.586 and 183.588.

EFFECTIVE DATE: FEBRUARY 1, 1978

EACH fuel tank with a capacity of 100 gallons or more must be designed and constructed so that if it is selected to be subjected to both the pressure-impulse and slosh tests according to the procedures of 183.586 and 183.588 respectively. It will not leak following the pressure-impulse test and the slosh test when pressure tested following each of these tests, to the pressure marked on its label using the procedure described in 183.580.

Selection of a tank for the pressure-impulse and slosh tests may be made by the USCG in order to conduct a compliance check. A manufacturer may also select a representative tank and subject it to the pressure-impulse and slosh tests in order to assure compliance.

DO YOU COMPLY

The fuel tank's capacity is 100 or more gallons ( )

The fuel tank will withstand the pressure-impulse test described in 183.586. Be sure to pre-condition non metallic fuel tanks per 183.586(b). ( )

The fuel tank does not leak following the pressure-impulse test. ( )
Use procedures described in 183.580.
Use pressure marked on tank label.

The fuel tank will withstand the slosh test described in 183.588. ( )

The fuel tank does not leak following the slosh test. ( )
Use procedures described in 183.580.
Use pressure marked on tank label.

IT'S THE LAW

183.512 FUEL TANKS: PROHIBITED MATERIALS

(a) A fuel tank must not be constructed from terne-plate.

EFFECTIVE DATE: AUGUST 1, 1978

Terneplate is steel that has been electroplated with a lead-tin alloy. Since the lead-tin alloy is cathodic relative to steel, in the presence of an electrolyte the steel can corrode galvanically weakening the tank's structure.

While terneplate tanks are prohibited for use as fuel tanks on boats with gasoline engines, terneplate may be used for:

Fuel tanks for outboard motor boats.
Portable fuel tanks.
Portable fuel containers.
Diesel fuel tanks

DO YOU COMPLY

The fuel tank is constructed from a material other than terneplate. ( )

IT'S THE LAW

183.512 FUEL TANKS: PROHIBITED MATERIALS:

(b) Unless it has an inorganic sacrificial galvanic coating on the inside and outside of the tank, a fuel tank must not be constructed from black iron or carbon steel.

EFFECTIVE DATE: AUGUST 1, 1978

An inorganic sacrificial galvanic coating is a treatment applied to steel that combines the steel base metal with a surface of another metal, such as zinc and aluminum, which are anodic to the base metal. Such materials are known as galvanized steel and aluminized steel.

It is important that the metallic coatings are anodic to steel. Of the widely known materials the following are anodic to steel:

Magnesium
Zinc
Aluminum

Organic materials may not be used. Organic materials include paints, resins, epoxy coatings, metallic paints etc.

DO YOU COMPLY

If the fuel tank is constructed of black iron or carbon steel:

Has it been galvanized inside and out? ( )
Has it been constructed of aluminized steel? ( )

IT'S THE LAW

183.512 FUEL TANKS: PROHIBITED MATERIALS

(c) A fuel tank encased in cellular plastic or in fiber reinforced plastic must not be constructed from a ferrous alloy.

EFFECTIVE DATE: AUGUST 1, 1978

Ferrous alloys are metals containing the chemical element iron as one of its major components. Materials such as black iron, carbon steel, galvanized steel, aluminized steel, terneplate, and stainless steel are examples of ferrous alloys.

Cellular plastic and/or fiber reinforced plastic may not be used to install ferrous alloy fuel tanks.

DO YOU COMPLY

Is the fuel tank constructed of a ferrous alloy? ( )

If YES, it may not be encased in cellular plastic or fiber reinforced plastic.
If NO, cellular plastic or fiber reinforced plastic is acceptable for encasement.

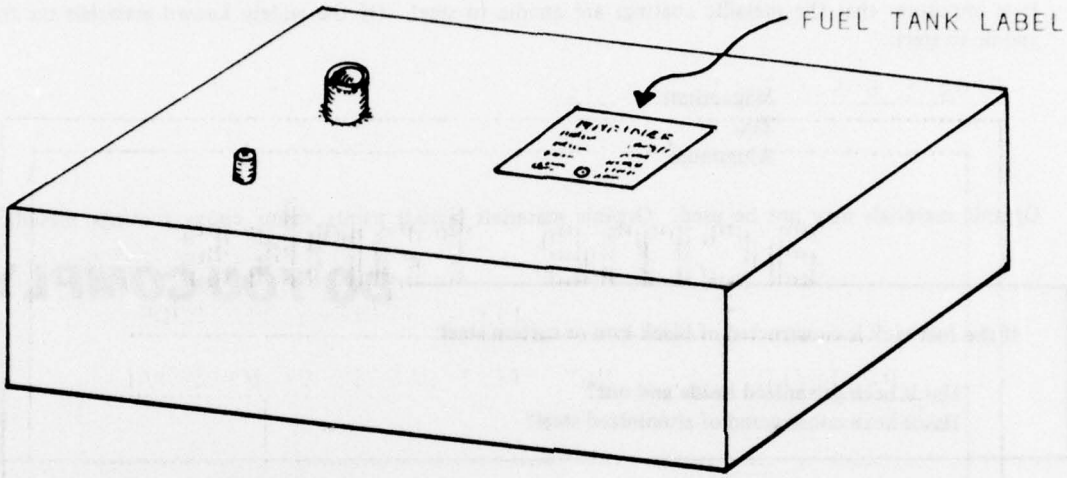
IT'S THE LAW

183.514 FUEL TANKS: LABELS

(a) Each fuel tank must have a label that meets the requirements of paragraphs (b) through (d) of this section.

EFFECTIVE DATE: FEBRUARY 1, 1978

FIGURE 7 - FUEL TANK LABEL



DO YOU COMPLY

Is there a label on the fuel tank? ( )
If the fuel tank is encased, is the label visible after installation? ( )

IT'S THE LAW

183.514 FUEL TANKS: LABELS

(b) Each label required by paragraph (a) of this section must contain the following information:

(1) Fuel tank manufacturer's name (or logo) and address.

(2) Month (or lot number) and year of manufacture.

(3) Capacity in U.S. gallons.

(4) Material of construction.

(CONTINUED)

(CONTINUED FROM PREVIOUS PAGE)

(5) The pressure the tank is designed to withstand without leaking.

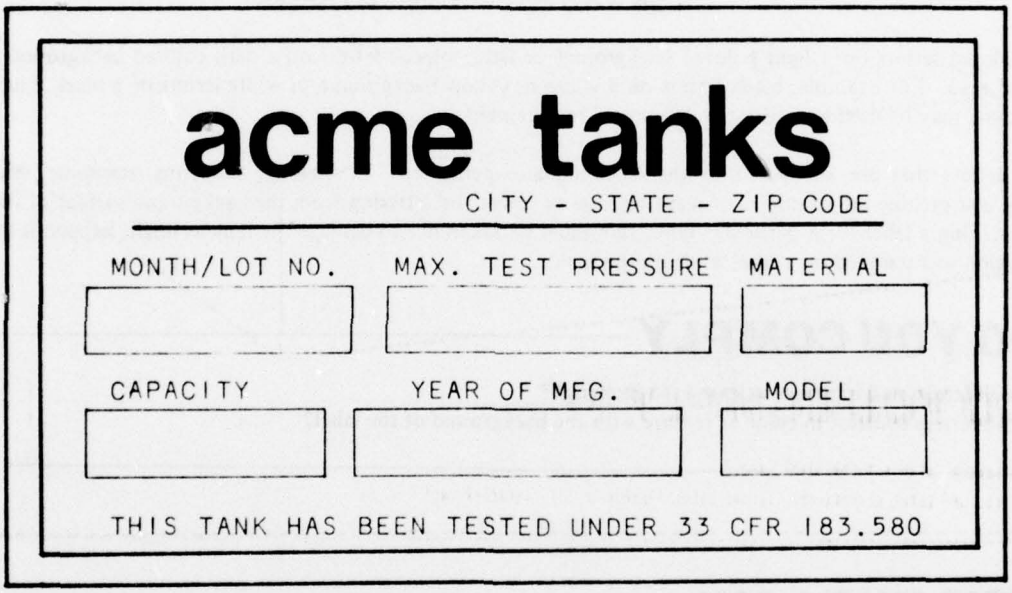
(6) Model number, if applicable.

(7) The statement, "This tank has been tested under 33 CFR 183.580".

(8) If the tank is tested under 183.584 at less than 25g vertical accelerations the statement, "Must be installed aft of the boat's half length".

EFFECTIVE DATE: FEBRUARY 1, 1978

FIGURE 8 - FUEL TANK LABEL



DO YOU COMPLY

Does the fuel tank label have all the following items of information?

Manufacturer's Name or logo	( )
Manufacturer's Address	( )
Month or Lot Number	( )
Year of Manufacture	( )
Capacity	( )
Material	( )
Maximum Test Pressure	( )
The statement, "This tank has been tested under 33CFR 183.580".	( )

If applicable

The statement, "Must be installed aft of the boats half length".	( )

IT'S THE LAW

183.514 FUEL TANKS: LABELS

(c) Each letter and each number on a label must –

(1) be at least 1/16 inch high and

(2) contrast with the basic color of the label or be embossed on the label.

EFFECTIVE DATE: FEBRUARY 1, 1978

The minimum letter and number size has been established at 1/16 inch in height for the required information. Additional information may be displayed in smaller lettering. This is equivalent to 8 point upper case (capitals) lettering in printer's terminology.

THIS IS A SAMPLE OF 8 POINT LETTERING

Dark colored letters on a light colored background or light colored letters on a dark colored background will be easier to read. For example, black letters on a white or yellow background, or white letters on a black, blue or red background may be used to satisfy the "contrast" requirement.

Raised letters that are stamped into the label are also permitted. Embossing, debossing, stamping, engraving, molding and etching are examples of ways to raise or lower the lettering from the background surface of the label. When marking a label for a particular tank, care must be taken not to damage the tank as might happen if the label information was stamped on a label while on the tank.

DO YOU COMPLY

Are all letters and numbers at least 1/16 inch high? ( )
Do all letters contrast in color or texture with the background of the label? ( )

IT'S THE LAW

183.514 FUEL TANKS: LABELS

(d) Each label must –

(1) withstand the combined effects of exposure to water, oil, salt spray, direct sun light, heat, cold, and wear expected in normal operation of the boat, without loss of legibility; and

(2) resist efforts to remove or alter the information on the label without leaving some obvious sign of such efforts.

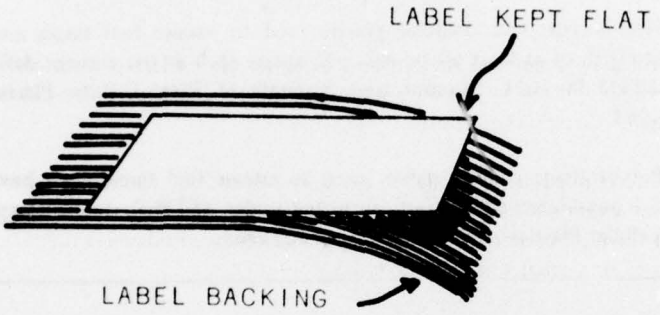
EFFECTIVE DATE: FEBRUARY 1, 1978

Labels are required to be durable so they may be used to identify a fuel tank, and provide the information required in Section 183.514(b) of this regulation. Labels should be used that have demonstrated durability, either by experience in service or by test, considering all the listed exposure items.

Labels shall be designed, manufactured or installed so that any effort to remove or change the information thereon is apparent. Some pressure sensitive labels will self-destruct upon removal. Printed labels that have raised letters make it difficult to alter information.

The application of the label, particularly the pressure sensitive type, is important. Many types of labels will tend to curl up at their edges unless they are applied correctly. The backing should be peeled off of the label keeping the label flat instead of the other way around. See Figure 9.

FIGURE 9 - PRESSURE SENSITIVE LABEL



DO YOU COMPLY

Will the label withstand exposure to:

Water	( )
Oil	( )
Salt Spray	( )
Direct Sunlight	( )
Heat	( )
Cold	( )
Wear	( )

Will the label show signs of efforts to:

Remove data	( )
Alter data	( )

IT'S THE LAW

183.516 CELLULAR PLASTIC USED TO ENCASE FUEL TANKS

(a) Cellular plastic used to encase metallic fuel tanks must –

(1) not change volume by more than five percent or dissolve after being immersed in any of the following liquids for 24 hours at 29°C:

(i) Reference fuel B ASTM D–471, dated December 18, 1968.

(ii) No. 2 reference oil of ASTM D–471, dated December 18, 1968.

(iii) Five percent solution of trisodium phosphate in water; and

(2) not absorb more than 0.12 pound of water per square foot of cut surface, measured under Military Specification MIL P–21929B, dated June 22, 1970.

(b) Non-polyurethane cellular plastic used to encase fuel tanks must have a compressive strength of at least 60 pounds per square inch at ten percent deflection measured under ASTM D–1621, "Compressive Strength of Rigid Cellular Plastics", dated August 31, 1964.

(c) Polyurethane cellular plastic used to encase fuel tanks must have a density of at least 3.2 pounds per cubic foot, measured under ASTM D–1622, "Apparent Density of Rigid Cellular Plastics", dated September 30, 1963.

EFFECTIVE DATE: AUGUST 1, 1978

If cellular plastic is to be used to encase a metallic fuel tank, it must as a minimum, comply with the properties and tests specified in the regulation above.

If the cellular plastic used for encasing a metallic fuel tank is to be counted as part of the flotation required for boats under 20 feet in length by 33 CFR 183 Subpart F, it may be required to comply with additional properties and tests as described below.

a. If – The encasing cellular plastic is:
(1) In the engine compartment, and
(2) BELOW a height of 12 inches above the lowest point where liquid can collect in that compartment;

Then – The cellular plastic must not change volume by more than five percent or dissolve after being immersed in any of the following liquids for 30 DAYS (instead of 24 hours) at 29°C(84.2°F).
(1) Reference fuel B of ASTM D–471, dated December 18, 1968.
(2) Number 2 reference oil of ASTM D–471, dated December 18, 1968.
(3) Five percent solution of trisodium phosphate in water.

b. If – The encasing cellular plastic is:
(1) In the engine compartment, and
(2) ABOVE a height of 12 inches above the lowest point where liquid can collect in that compartment;

Then – The cellular plastic must not reduce in volume by more than five percent, or dissolve, after being immersed in a fully saturated gasoline vapor atmosphere for 30 DAYS at 38°C(100.4°F).

c. If – The encasing cellular plastic is:

(1) Outside the engine compartment, and

(2) BELOW a height of 4 inches above the lowest point where liquid can collect in that compartment;

Then – The cellular plastic must not change volume by more than five percent, or dissolve, after being immersed in any of the following liquid for 30 DAYS (instead of 24 hours) at 29°C(84.2°F).

(1) Reference fuel B of ASTM D–471, dated December 18, 1968.

(2) Number 2 reference oil of ASTM D–471, dated December 18, 1968.

(3) Five percent solution of trisodium phosphate in water.

Suppliers of cellular plastic should be able to advise if their product complies with these specifications.

NOTE: The 4 and 12 inch heights are measured when the boat is in the "static floating position". Refer to 183.505.

TABLE I

CELLULAR PLASTIC REQUIREMENTS IF USED FOR BOTH FUEL TANK ENCASEMENT AND FLOTATION

	TESTS				
LOCATION	24 hour Immersion 183.516(a)(1)	30 day Immersion	Water Absorption 183.516(a)(2)	Compressive Strength or Density 183.516(b) or (c)	Saturated Gasoline Vapor
Engine Compartment					
Below 12 inch height		X	X	X	
Above 12 inch height	X		X	X	X
Outside Engine Compartment					
Below 4 inch height		X	X	X	
Above 4 inch height	X		X	X	

A boat builder may choose to accept a cellular plastic supplier's certification to these requirements. Alternatively these tests can be performed by the boat manufacturer or a laboratory. There is special equipment involved and careful measurements required in accord with laboratory techniques. It is recommended that all referenced standards and specifications be obtained, and that the tests be performed in accordance with the detailed instructions contained therein.

Regardless of who performs the tests, the boat builder is responsible for compliance.

DO YOU COMPLY

Cellular plastic meets the applicable immersion requirements. ( )

Cellular plastic meets the water absorption requirement. ( )

Non-polyurethane cellular plastic meets the compressive strength requirement (60 pounds per square inch at 10 percent deflection). ( )

Polyurethane cellular plastic meets the density requirement (3.2 pounds per cubic foot minimum). ( )

IT'S THE LAW

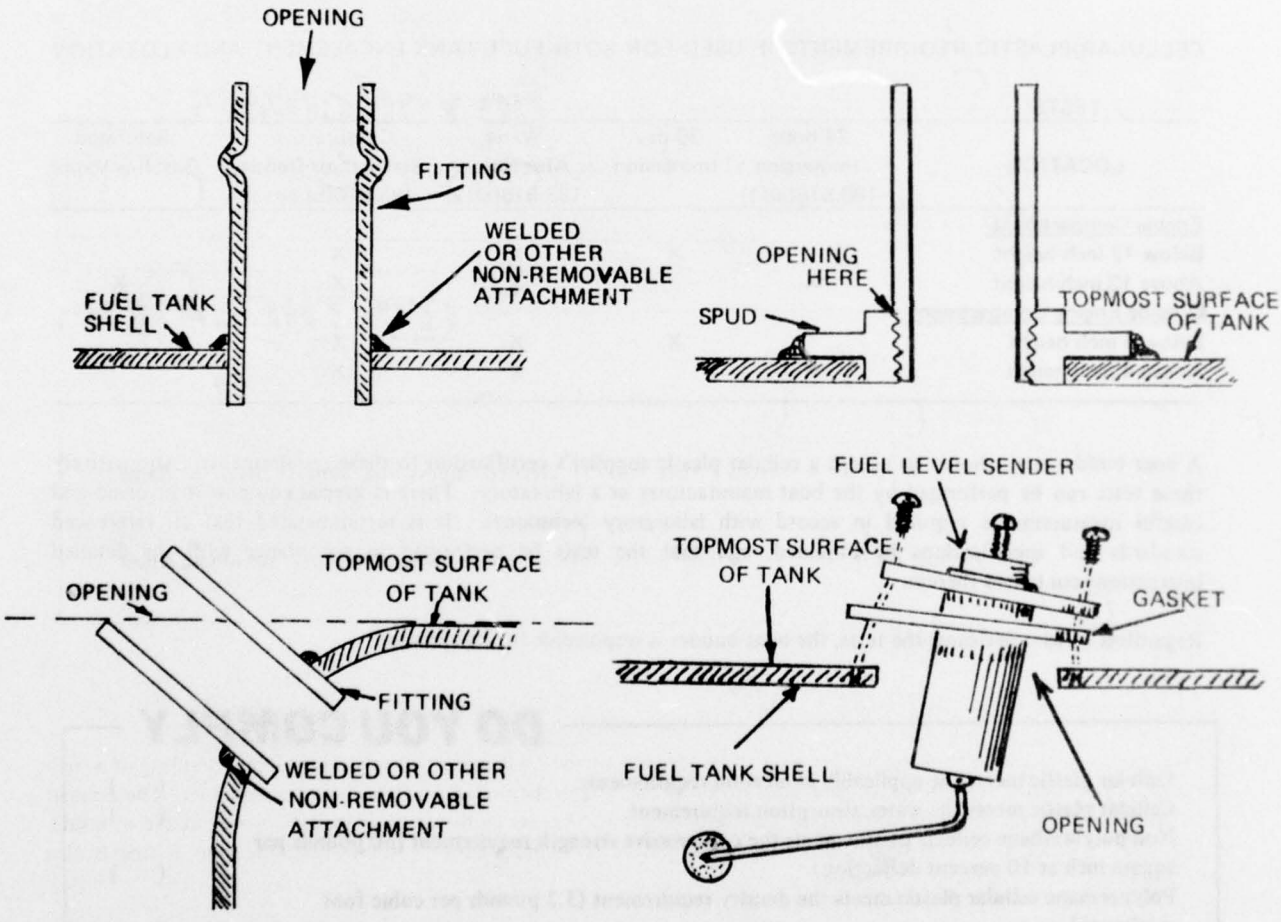
183.518 FUEL TANK OPENING

Each opening into the fuel tank must be at or above the topmost surface of the tank.

EFFECTIVE DATE: AUGUST 1, 1977

Fuel tank openings refer to holes into which fittings may be installed or fuel lines attached. Fuel tank fill, fuel tank vent, fuel distribution, fuel tank sounding, and fuel level sender fitting accesses are examples of such holes. If the attachment fitting is welded or attached by other non-removable means to the fuel tank the opening is considered at the top of the attachment. The accompanying sketches will clarify this interpretation.

FIGURE 10 - FUEL TANK OPENINGS



DO YOU COMPLY

Are all openings at or above the topmost surface of the tank? ( )

IT'S THE LAW

183.520 FUEL TANK SYSTEMS

(a) **Each fuel tank must have a vent system that prevents pressure in the tank from exceeding 80 percent of the pressure marked on the tank label under 183.514 (b) (5).**

EFFECTIVE DATE: AUGUST 1, 1977

Pressure build-up can occur in a fuel tank due to temperature changes and during filling. The fuel tank vent system must be designed and installed to prevent the pressure build-up from exceeding 80 percent of the pressure marked on the tank label.

Unless there is trapped liquid or a clogged vent, temperature changes should not cause pressure problems. Filling a fuel tank at the normal rate of liquid flow (9–12 gallons per minute) found with most fuel dispensing pumps (some may put out more), might present a problem if too small a vent line is selected, or if there are restrictions in the line. The blow-back requirement of 183.522 provides for venting considerations during filling. It has been generally found that a 9/16 inch inside diameter vent line with not less than 7/16 inch inside diameter fittings, provides sufficient flow capability to allow the fuel tank to breathe without excessive pressure build-up. It must be emphasized that vent lines be installed so there are no potential liquid traps.

DO YOU COMPLY

Does the vent prevent fuel tank pressure build-up from exceeding 80 percent of the marked on the label? ( )

IT'S THE LAW

183.520 FUEL TANK SYSTEMS

(b) **Each vent must –**

(1) **have a flame arrester that can be cleaned unless the vent is itself a flame arrestor; and**

(2) **not allow a fuel overflow at the rate of up to two gallons per minute to enter the boat.**

EFFECTIVE DATE: AUGUST 1, 1977

Fuel tank vent flame arresters must be able to be cleaned so they will not adversely restrict the breathing of a fuel tank. Flying particles, debris and salts from sea spray can attach themselves to flame arrester elements. There must be some means to free the arrester from this contamination. Access to the arrester may be from outside or inside the boat as long as it can be accomplished in a normal servicing manner. Removal of the vent fitting is also acceptable.

It is possible that a fuel tank vent system itself may perform the function of a flame arrester. The diameter and length of the vent tubing and its routing are considerations in designing a fuel tank vent system that is itself a flame arrestor. There are no recommendations of proper diameters and lengths at this time. The burden of proof as to whether a fuel tank vent system performs is the boat manufacturers.

The fuel tank vent outlet fitting must be located so that overflowing fuel coming out of the vent at a rate of up to 2 gallons per minute will not enter the boat.. This requirement may involve deck design, cockpit coaming design, air vent location, hawse hole design for underdeck cleating of lines and any other opening that overflowing fuel might run to, to get into the boat.

The location of the fuel vent opening must be chosen keeping the following considerations in mind;

a. Nearby ventilators, on deck or on the side of a boat could provide access for fuel to flow inside a boat. The distance between fuel vent opening and ventilators may have to be increased over that normally considered adequate for keeping vapors from entering ventilators.
b. The deck configuration and its slope could channel overflow fuel into a boat.
c. High coamings or cabin sides can offer protection against overflow fuel from flowing inside of a boat.
d. Deck joints in riveted construction or wooden construction could provide a path for fuel to flow to the boat's interior unless they are caulked to resist such fuel leakage.

DO YOU COMPLY

If a vent has a flame arrester, can it be cleaned? ( )

Does the fuel tank vent system prevent overflow of up to 2 gallons per minute from getting into the boat? ( )

IT'S THE LAW

183.522 FUEL TANK FILL SYSTEMS

Fuel must not blow back through the fuel fitting when a tank is –

(a) between one-fourth and three-fourths full; and

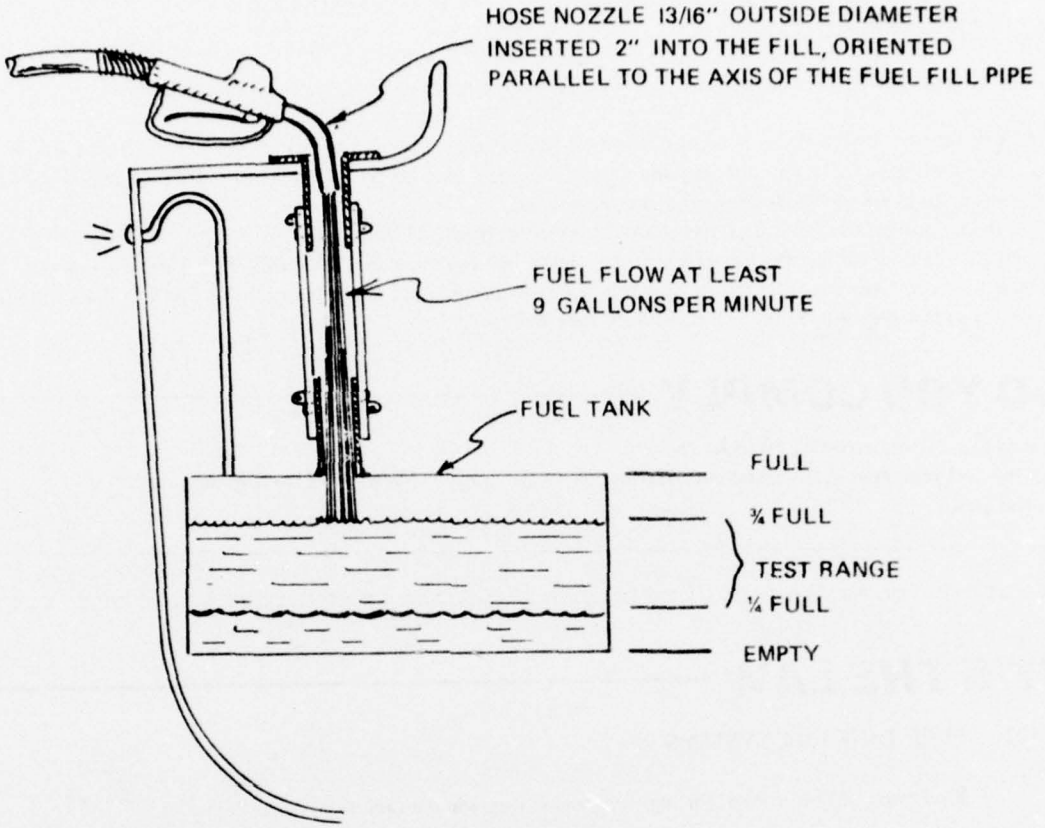
(b) refueled at a rate of at least nine gallons per minute.

EFFECTIVE DATE: FEBRUARY 1, 1978

Blow-back is defined as liquid gasoline sufficient to wet any exterior surface. Occasional vapor carried droplets shall not be considered blow-back. Fuel blow-back can occur when filling a tank and the displacement of air from inside the tank is restricted, such that a pressure builds up and spits fuel back through the fill fitting. The design of the fill system should provide a route as direct to the tank as possible, minimizing sharp bends and avoiding liquid traps.

The test to determine if the installation is correct involves filling a fuel tank at a rate of at least 9 gallons per minute starting with the tank filled to at least one-fourth its capacity, but not more than three-fourths its capacity.

FIGURE II - FUEL BLOW-BACK TEST



DO YOU COMPLY

There is no fuel blow-back when filled at 9 gallons per minute? ( )

IT'S THE LAW

183.524 FUEL PUMPS

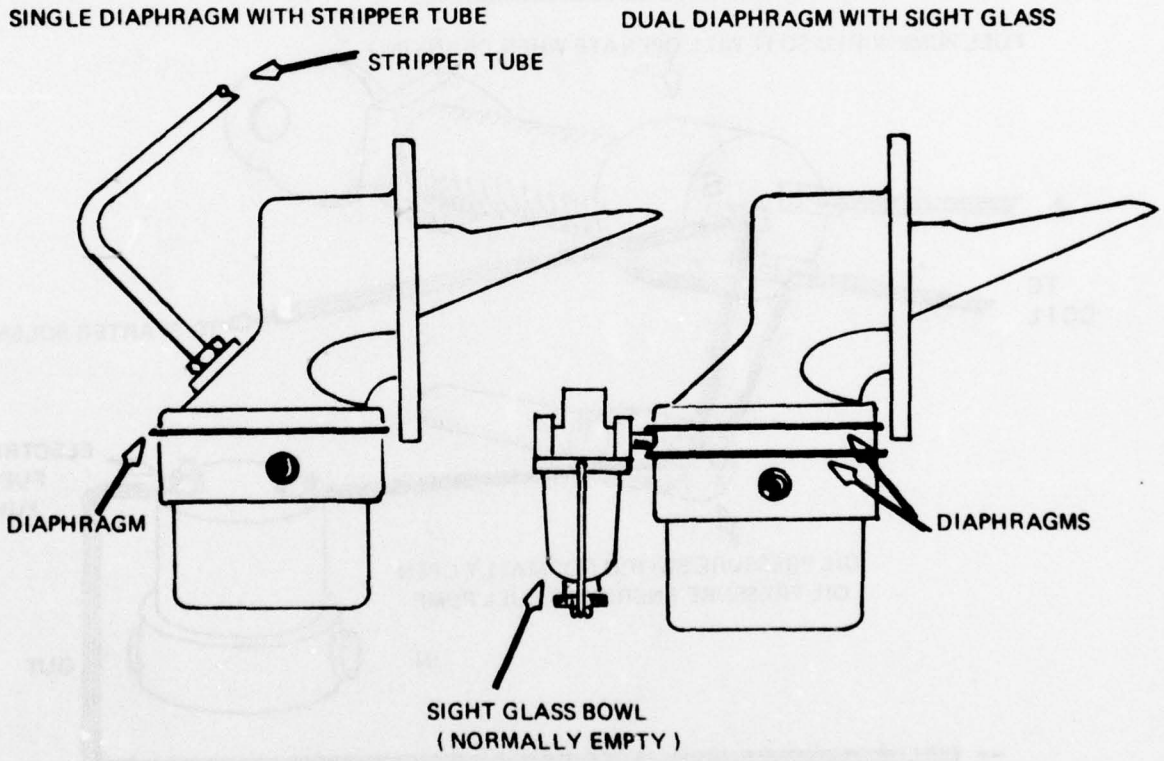
(a) Each diaphragm pump must not leak fuel from the pump if the primary diaphragm fails.

EFFECTIVE DATE: AUGUST 1, 1978

A diaphragm pump is the usual type of fuel pump found on marine engines. This requirement calls for a means to prevent fuel from leaking into the interior of the boat (bilge more than likely) if the main diaghragm fails. Some means presently used to accomplish this are:

(1) A second diaphragm with a means of identifying failure of the primary diaphragm, such as a sight glass bowl, and
(2) A sealed fuel pump housing connected to the crankcase or equipped with a stripper tube connected to the carburetor.

FIGURE 12 - FUEL PUMPS, DIAPHRAGM TYPE



DO YOU COMPLY

Is there provision to prevent fuel leakage if the primary diaphragm of a fuel pump fails? ( )

IT'S THE LAW

183.524 FUEL PUMPS

(b) Each electrically operated fuel pump must not operate except when the engine is operating or when the engine is started.

EFFECTIVE DATE: AUGUST 1, 1978

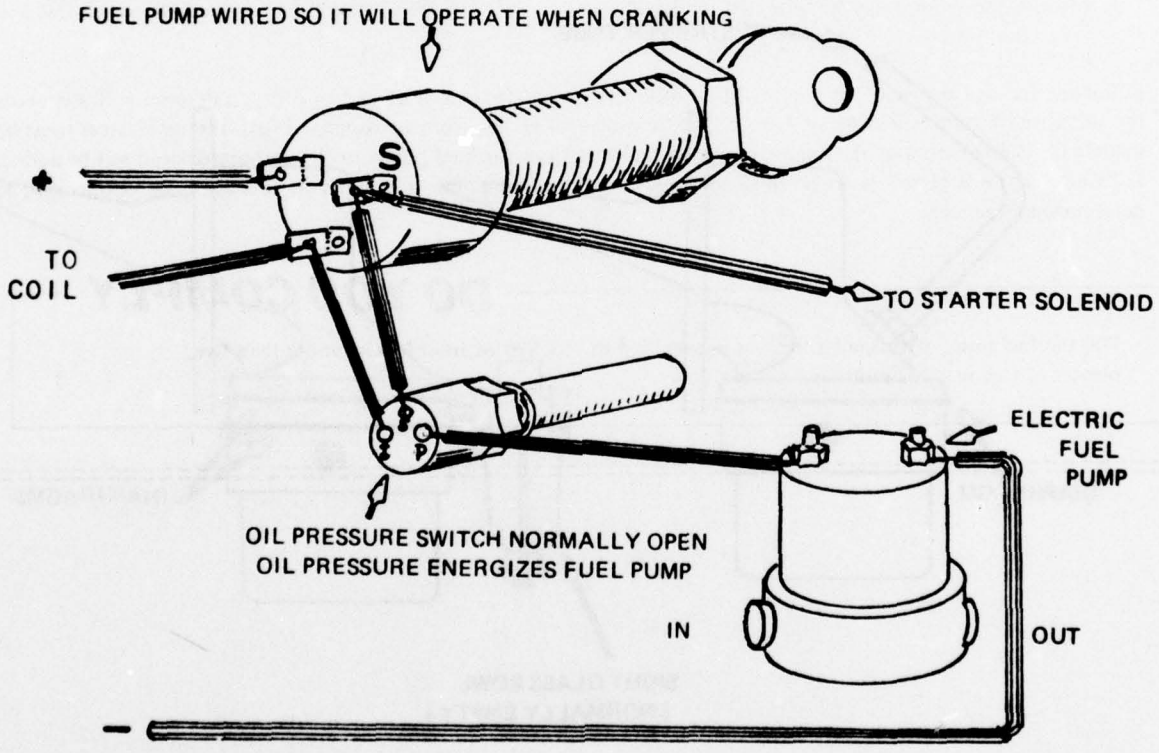
Electric fuel pumps are not permitted to be operable except:

(1) During the engine starting procedure, and
(2) While the engine it serves is operating.

This requirement does not apply to electric fuel pumps used to transfer fuel between tanks.

One method to accomplish compliance with this requirement is by means of the wiring for the electric fuel pumps. It may be wired to operate only when the starter is operating and also wired by means of an oil pressure switch to continue operating only as long as the engine it serves is operating.

FIGURE 13 - WIRING DIAGRAM FOR ELECTRIC FUEL PUMP



DO YOU COMPLY

If an electric pump is used, is there provision to prevent it from operating except when the engine it serves is started or running? ( )

IT'S THE LAW

183.524 FUEL PUMPS

(c) If tested under 183.590, each fuel pump, as installed in the boat must not leak more than five ounces of fuel in 2 1/2 minutes, inclusive of leaks from fuel line, fuel filter and strainer.

EFFECTIVE DATE: AUGUST 1, 1978

Fuel pumps must be able to withstand the 2 1/2 minutes fire test as described in 183.590 of this regulation. The fuel pump may be tested separately in a fire chamber or as installed on an engine. If a fuel pump can be mounted either on the engine or remotely such as an electrically operated fuel pump it may be tested according to where it is located in a specific installation. For example:

(1) If the electric fuel pump is to be mounted on an engine, it may be fire tested on an engine.
(2) If it is to be mounted remote from the engine, but in compliance with 183.566 (within 12 inches of the engine), it may be fire tested with the engine providing the fire pan under the engine includes the fuel pump.
(3) If it is to be mounted remote from the engine, such as a fuel transfer pump, it must be tested in a fire chamber as a separate component.
(4) A fuel pump may be qualified for installation in any permitted location by conducting the fire test in a fire chamber.

Following the fire test the fuel pump will be subjected to a 3 foot head of fuel in order to determine if it exceeds the permitted 5 ounces leakage of fuel in 2 1/2 minutes. Leakage from an associated fuel filter or strainer must be included. The contents of the engine mounted fuel line from the fuel pump to the carburetor need not be added. If "USCG Type B Hose" is to be used to connect to the fuel pump inlet then its leakage must be included to determine compliance.

DO YOU COMPLY

Will the fuel pump withstand a fire test as specified in 183.590 without leaking more than five ounces of fuel in 2 1/2 minutes. ( )

IT'S THE LAW

183.526 CARBURETORS

(a) Each carburetor must not leak more than five cubic centimeters of fuel in 30 seconds when –

(1) the float valve is open;

(2) the carburetor is at half throttle; and

(3) the engine is cranked without starting;

EFFECTIVE DATE: AUGUST 1, 1978

NOTE: There are two leakage tests for carburetors to satisfy the intent of 183.526(a). The test described on this page relates to 183.526(a), (1), (2) and (3). The test on Page 48 relates to 183.526(a)(4).

Carburetors are required to be tested to determine if they will leak externally under simulated flooding conditions. Leakage in excess of five cubic centimeters (5cc) in 30 seconds is not permitted. The quantity of leakage is to be measured in accordance with the following procedure:

(1) Assure that the float valve is open. For this test the float valve must be held open by jamming the valve or aborting the float so fuel will be permitted to flow into the carburetor.
(2) The carburetor throttle is to be placed at a half open position.
(3) Depending on the type of fuel pump the engine must be cranked or the fuel pump energized. It is not intended to start the engine during this leakage test.

Fuel shall be pumped to the carburetor for a period of 30 seconds by either of the described methods, cranking the engine or operating the fuel pump. Not more than 5cc of fuel may leak from the carburetor during the 30 second timed period. Internal fuel leakage, such as to the intake manifold is not considered leakage. Only that leakage which occurs externally is to be counted.

NOTE: A more detailed description of the test is available in the "United States Coast Guard Compliance Test Procedures-Fuel System Standards, Leak-Test of Carburetors". Copies of this standard are available from:

National Technical Information Service
Springfield, VA 22151

DO YOU COMPLY

With the float valve open and the throttle half open, the carburetor will not leak more than 5cc of fuel in 30 seconds:

While engine is cranked without starting, ( )

IT'S THE LAW

183.526 CARBURETORS

(a) Each carburetor must not leak more than five cubic centimeters of fuel in 30 seconds when –

(4) the fuel pump is delivering the maximum pressure specified by its manufacturer.

EFFECTIVE DATE: AUGUST 1, 1978

NOTE: There are two leakage tests for carburetors to satisfy the intent of 183.526(a). The test described on this page relates to 183.526(a)(4). The test on page 47 relates to 183.526(a), (1), (2) and (3).

This test is to confirm the integrity of the float valve and is conducted as follows:

(1) the float valve is free to operate normally.
(2) the throttle is in the fully closed position.

Connect the fuel pump with the largest pressure intended for use with the carburetor and run it for **30 seconds.** During this period there shall be no more than 5cc observed gasoline flow coming from the carburetor fuel bowl vent port or any other place on the carburetor. This includes external and internal flow.

NOTE: A more detailed description of the test is available in the "United States Coast Guard Compliance Test Procedures–Fuel System Standards, Leak-Test of Carburetors". Copies of this standard are available from:

National Technical Information Service
Springfield, VA 22151

DO YOU COMPLY

With the float free and the throttle closed, the carburetor will not leak, externally or internally more than 5cc of fuel in 30 seconds:

While the fuel pump is delivering fuel at the maximum pressure specified by the manufacturer. ( )

IT'S THE LAW

183.526 CARBURETORS

(b) Each updraft and horizontal draft carburetor must have a device that –

(1) collects and holds fuel that flows out of the carburetor venturi section toward the air intake;

(2) prevents collected fuel from being carried out of the carburetor assembly by the shock wave of a backfire or by reverse air flow;

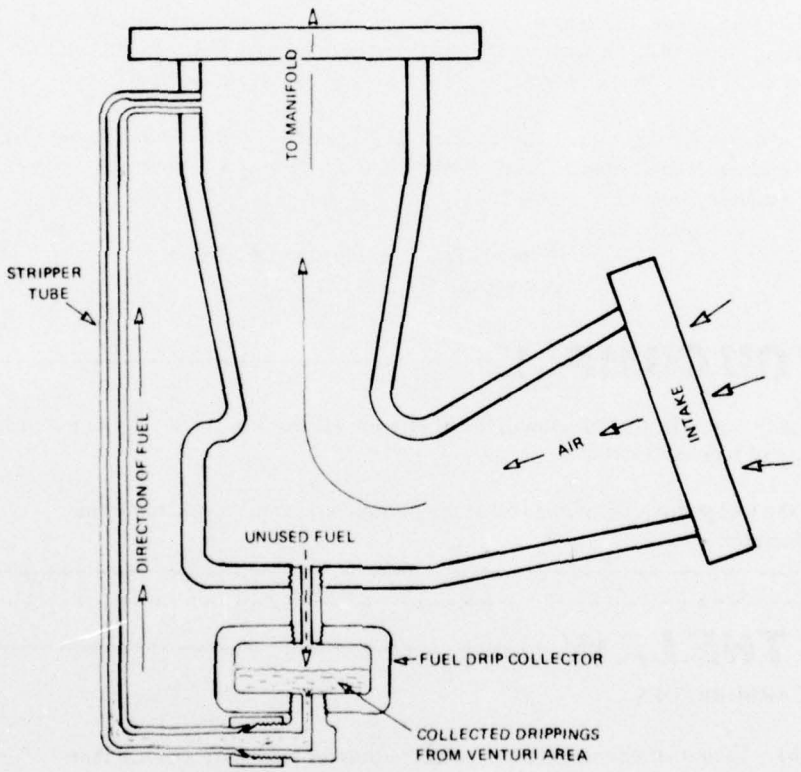
(3) returns collected fuel to the engine induction system after the engine starts.

If an engine uses an updraft or a horizontal draft carburetor then it must be fitted with means to collect fuel from flooding and return it to the engine so it will be consumed. Most propulsion engines have downdraft carburetors but auxiliary generators and some small propulsion engines have updraft or horizontal draft carburetors.

The collector for the fuel must be capable of holding or delivering to the engine a quantity of fuel that can collect during 12 ten second periods of cranking without external leakage from the air inlet or dripping of liquid fuel from joints in the air inlet components. The collector and carburetor must be designed so that fuel will run into the collector rapidly to prevent fuel collection in the carburetor horn where it can be expelled during a backfire or a "spit-back".

The collector must be fitted with a stripping means to return the collected fuel to the engine for combustion. Typically this stripper is a tube connected to the throat of the carburetor so that the manifold vacuum will pull the fuel out of the collector.

FIGURE 14 - UPDRAFT CARBURETOR



DO YOU COMPLY

If you have an updraft or horizontal draft carburetor, is it equipped with a means to collect fuel? ( )
Also, is there a means to return the fuel to the engine for combustion? ( )

IT'S THE LAW

183.528 FUEL STOP VALVES

(a) Each electrically operated fuel stop valve in a fuel line between the fuel tank and the engine must –

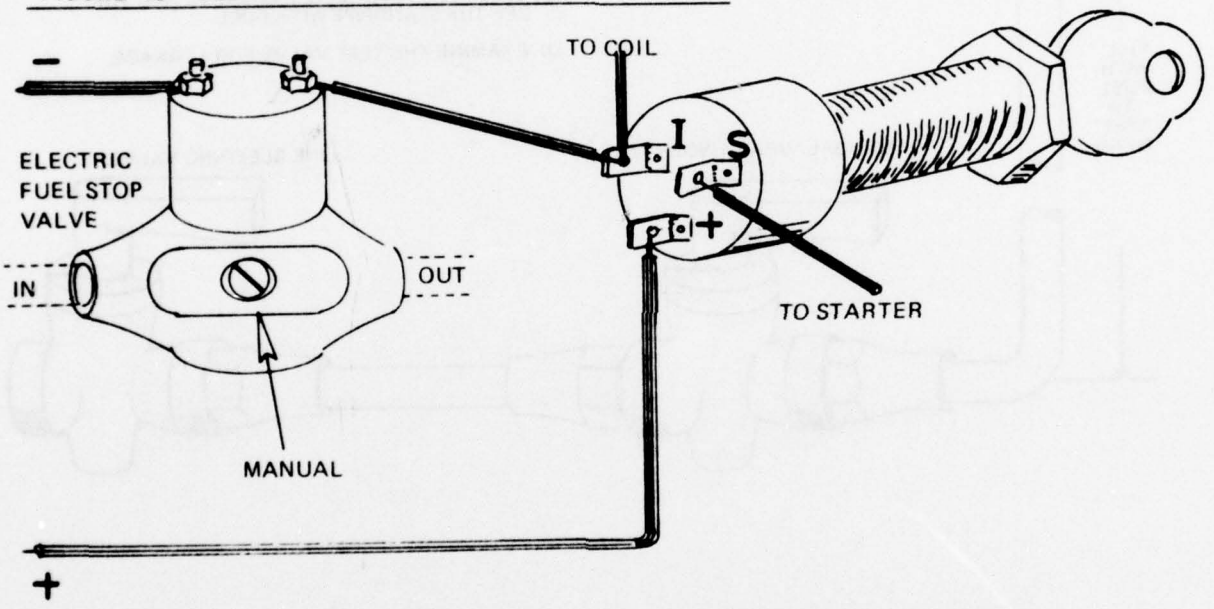
(1) open electrically only when the ignition switch is on; and

(2) operate manually.

EFFECTIVE DATE: AUGUST 1, 1977

If an electrically operated fuel stop valve is used in the fuel system, it must be wired to the ignition switch so it will open only when the ignition switch is on.

FIGURE 15 - ELECTRICALLY OPERATED FUEL STOP VALVE



DO YOU COMPLY

If you use an electrically operated fuel stop valve;

(1) It opens only when the ignition switch is on ( )
(2) It can be operated manually ( )

IT'S THE LAW

183.528 FUEL STOP VALVES

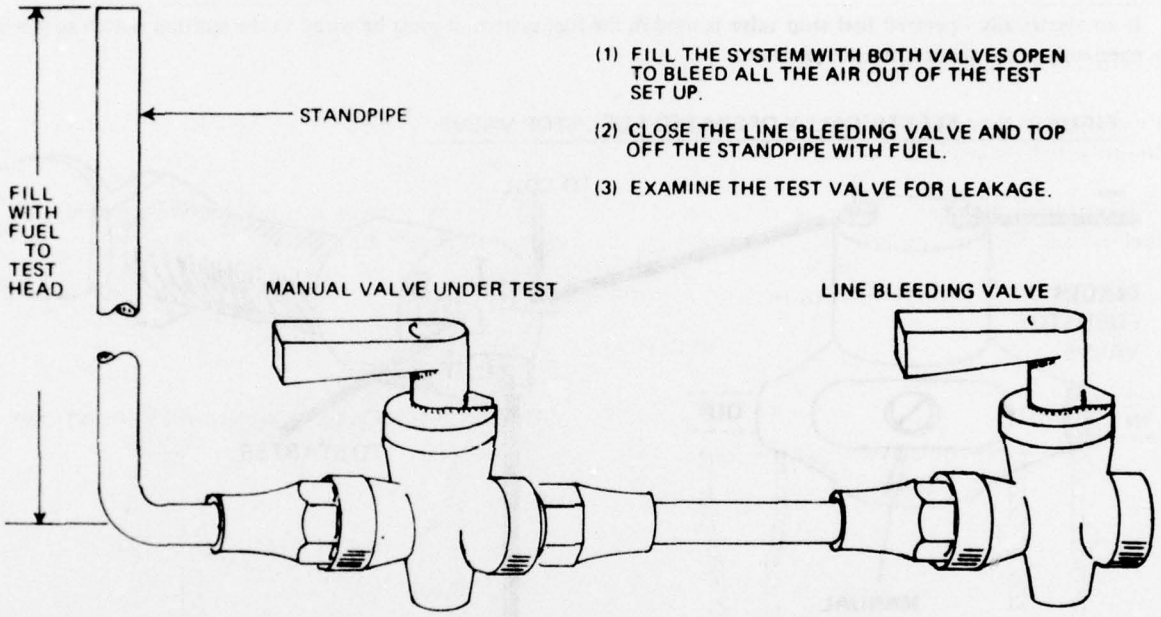
(b) If tested under 183.590, a fuel stop valve must not leak fuel.

EFFECTIVE DATE: AUGUST 1, 1977

All fuel stop valves, whether they are of the manual type or electrically operated and equipped with the required means for manual operation, must withstand the 2 1/2 minute fire test. Fuel stop valves must be tested in a fire chamber as described in 183.590(c) regardless of where they are installed.

After the fire test there shall be no leakage of fuel when subjected to the head as installed or a 36 inch head of fuel applied on the inlet side of the valve. Internal leakage such as could be expected with a soft seat type would not be considered leakage as long as it remained inside the fuel system.

FIGURE 16 - LEAKAGE TEST FOR VALVES



(1) FILL THE SYSTEM WITH BOTH VALVES OPEN TO BLEED ALL THE AIR OUT OF THE TEST SET UP.

(2) CLOSE THE LINE BLEEDING VALVE AND TOP OFF THE STANDPIPE WITH FUEL.

(3) EXAMINE THE TEST VALVE FOR LEAKAGE.

DO YOU COMPLY

Fuel stop valves (electric or manual) will withstand the fire test in 183.590, conducted in a fire chamber without external leakage. ( )

IT'S THE LAW

183.530 SPUD, PIPE, AND HOSE FITTING CONFIGURATION

Except when used for a tank fill line, each spud, pipe, or hose fitting used with hose clamps must have –

(a) a bead;

(b) a flare; or

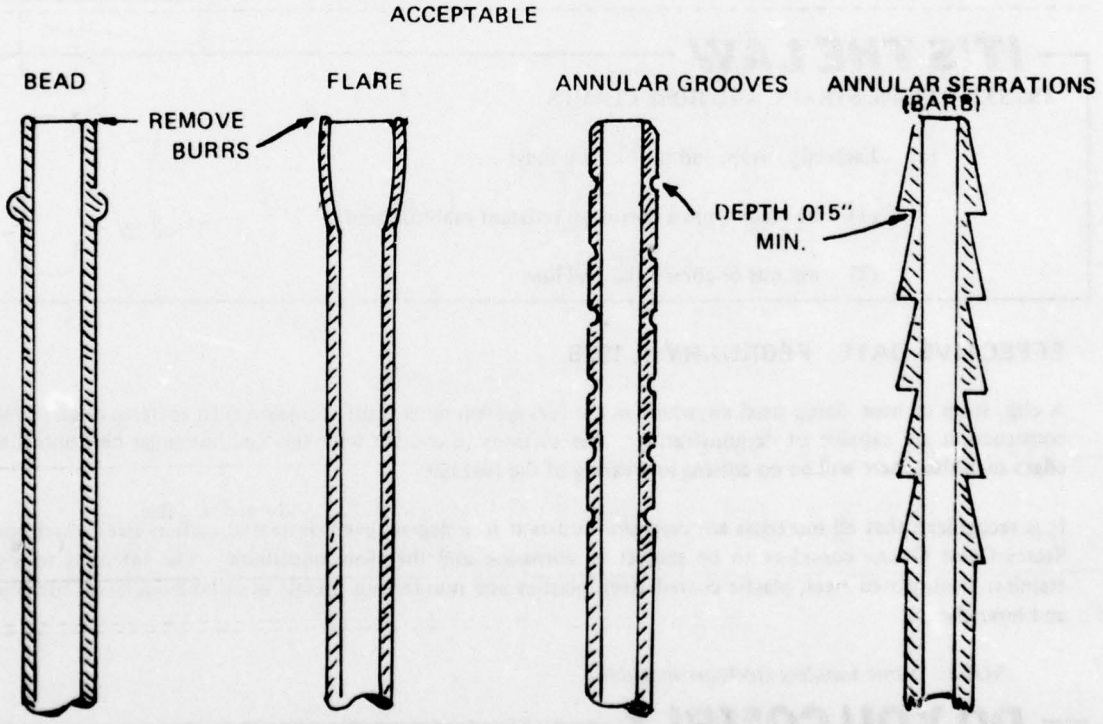
(c) a series of annular grooves or serrations no less than 0.015 inches deep, except a continuous helical thread, knurl, or groove.

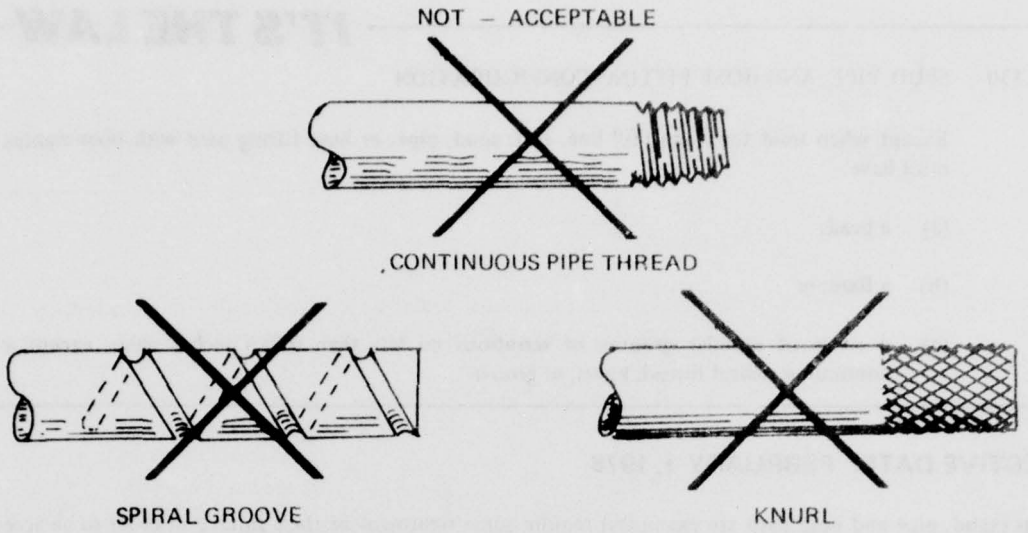
EFFECTIVE DATE: FEBRUARY 1, 1978

Fittings (spud, pipe and hose barb are examples) require some treatment of their surface in order to be acceptable for use with hose and hose clamps.

The regulation prohibits continuous helical threads (pipe threads) knurls or grooves which can provide a path for fuel leakage. Depicted are a number of acceptable type and some of those that are not.

FIGURE 17 - SPUD, PIPE AND HOSE FITTINGS





DO YOU COMPLY

Do all fittings used with hose and hose clamps have the proper configuration for hose attachment? ( )

IT'S THE LAW

183.532 CLIPS, STRAPS, AND HOSE CLAMPS

(a) Each clip, strap, and hose clamp must –

(1) be made from a corrosion resistant material; and

(2) not cut or abrade the fuel line.

EFFECTIVE DATE: FEBRUARY 1, 1978

A clip, strap or hose clamp used anywhere in the fuel system must resist corro... such as items of all stainless steel construction are capable of demonstrating. The surfaces in contact with the fuel line must be smooth and their edges such that there will be no cutting or wearing of the fuel line.

It is recognized that all materials are corrosion resistant to a degree, even untreated carbon steel which the United States Coast Guard considers to be subject to corrosion and therefore unsuitable. The intent is to accept; all stainless steel, plated steel, plastic coated steel, plastics and non-ferrous metals as suitable materials for clips, straps and hose clamps.

NOTE: Some stainless steels are magnetic.

DO YOU COMPLY

Clips, Straps and Hose Clamps:

(1) Are made of a corrosion resistant material as defined above. ( )
(2) Will not cut or abrade the fuel line. ( )

IT'S THE LAW

183.532 CLIPS, STRAPS, AND HOSE CLAMPS

(b) **When tested under 183.590, a clip, strap, or hose clamp must not separate under a one** pound tensile force.

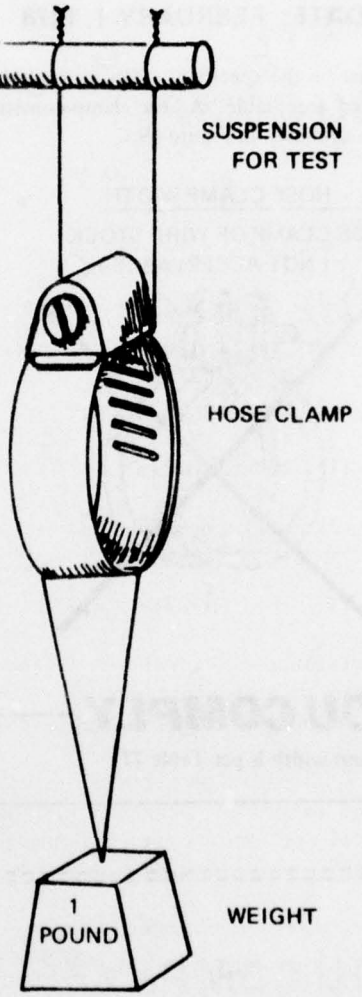
EFFECTIVE DATE: FEBRUARY 1, 1978

Hose clamps used to connect fuel lines in the fuel system must withstand a 2 1/2 minute fire test conducted in a fire chamber as described in 183.590(c). Tie straps, straps and clips used for support and bundling are not included in this requirement.

At the end of the 2 1/2 minute fire test the hose clamp must withstand a one pound force.

FIGURE 18 - HOSE CLAMP TENSILE TEST

NOTE : THE U. S. C. G. HAS PROPOSED A FUTURE AMENDMENT TO EXCEPT CLIPS AND STRAPS FROM THE REQUIREMENT IN 183.532 (b).



DO YOU COMPLY

Hose clamps will withstand a one pound tensile force after 2 1/2 minute fire test per 183.590. ( )

IT'S THE LAW

183.532 CLIPS, STRAPS, AND HOSE CLAMPS

(c) The minimum nominal band width of a hose clamp is determined under Table 7 by the outside diameter of the hose.

TABLE 7

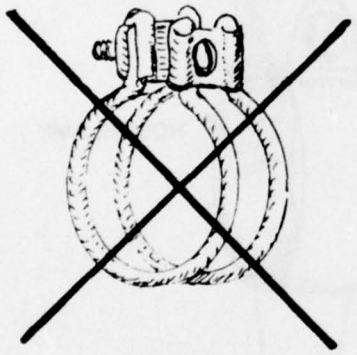
OUTSIDE HOSE DIAMETER (inches)	MINIMUM CLAMP BAND WIDTH (inches)
Less than 7/16	1/4
7/16 to 13/16	5/16
Greater than 13/16	1/2

EFFECTIVE DATE: FEBRUARY 1, 1978

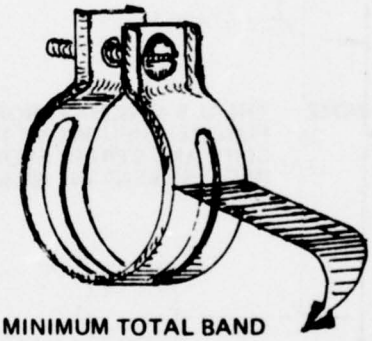
Hose clamps must be the specified width to minimize damage to the secured hose. Hose clamps made of wire stock are not considered acceptable. A hose clamp consisting of two bands joined at the means for tightening must have a total band width as shown in Figure 19.

FIGURE 19 - HOSE CLAMP WIDTH

HOSE CLAMP OF WIRE STOCK
(NOT ACCEPTABLE)



DOUBLE BAND HOSE CLAMP



MINIMUM TOTAL BAND WIDTH

DO YOU COMPLY

Hose clamp band width is per Table 7? ( )

IT'S THE LAW

183.534 FUEL FILTERS AND STRAINERS

If tested under 183.590, each filter and strainer, as installed in the boat, must not leak more than five ounces of fuel in 2 1/2 minutes inclusive of leaks from the fuel pump and fuel line.

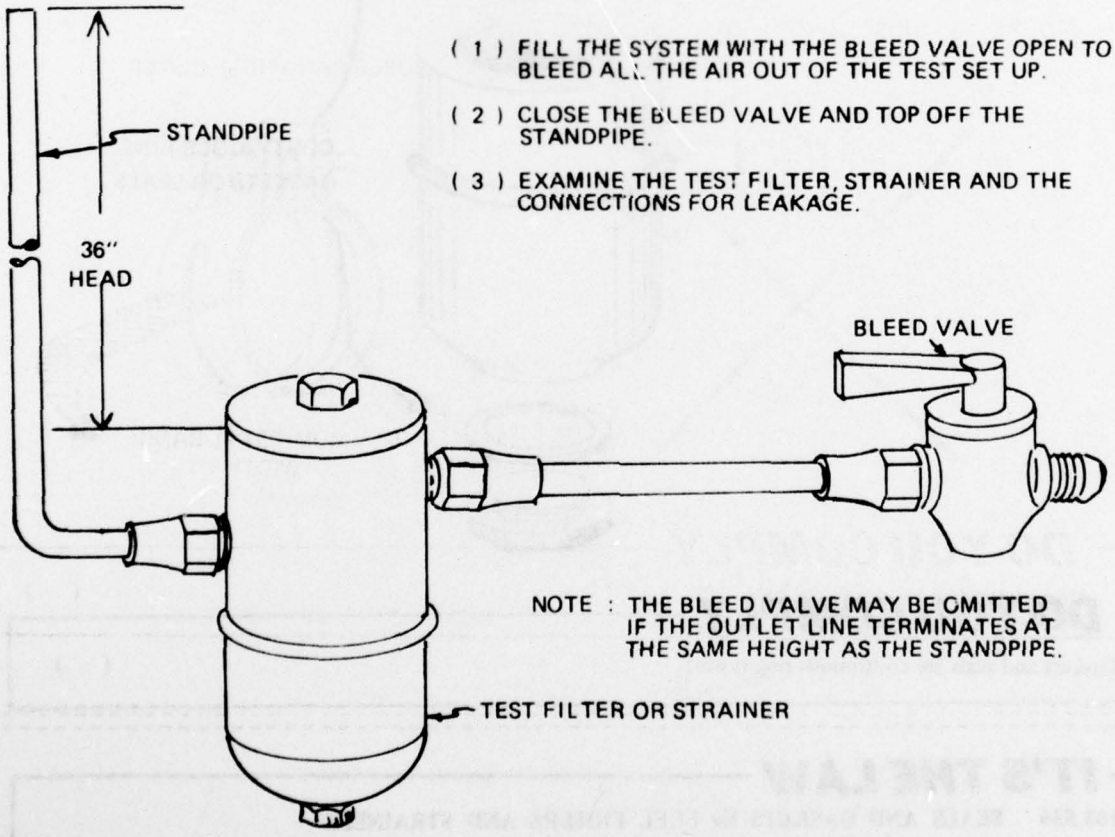
EFFECTIVE DATE: AUGUST 1, 1977

NOTE: If the fuel filter is integral with the pump the Effective Date is August 1, 1978.

Fuel filters, strainers and their connections must withstand a 2 1/2 minute fire test conducted as described in 183.590. The fire test may be performed on an engine for filters and strainers designed to be engine mounted or may be performed in a fire chamber to qualify a filter or strainer to be mounted anywhere in the fuel system.

After the fire test, the filter or strainer is to be subjected to a 3 foot head of fuel to determine its rate of leakage. Acceptable leakage is up to 5 ounces of fuel in 2 1/2 minutes but must include leakage from an associated fuel pump and fuel line. Internal leakage, destruction of straining or filtering elements and impairment of function are acceptable.

FIGURE 20 - LEAKAGE TEST FOR FUEL FILTERS AND STRAINERS



DO YOU COMPLY

Each fuel filter, strainer and its connections will not leak more than 5 ounces of fuel in 2 1/2 minutes after a 2 1/2 minute fire test per 183.590. ( )

IT'S THE LAW

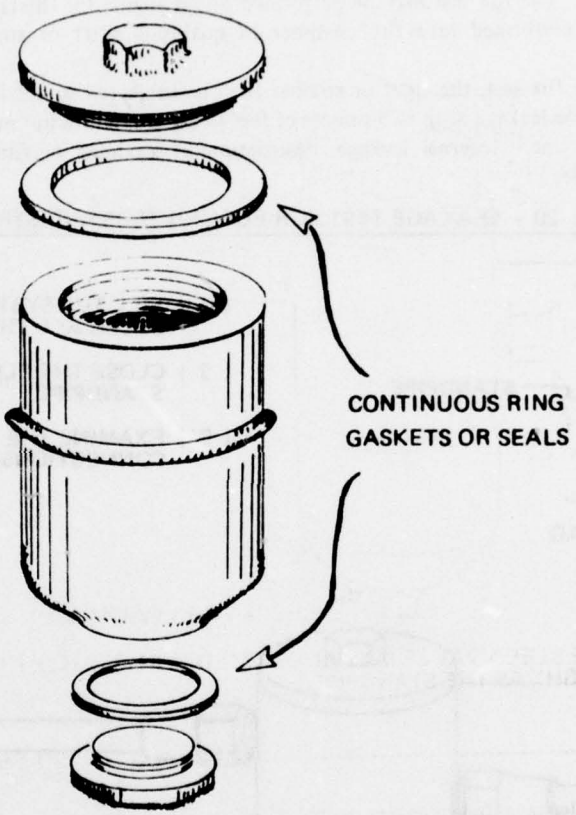
183.536 SEALS AND GASKETS IN FUEL FILTERS AND STRAINERS

(a) Each gasket and seal used in a fuel filter and strainer must form an unsplit ring.

EFFECTIVE DATE: AUGUST 1, 1977

Gaskets and seals used for filters and strainers can be a source of fuel leakage particularly when used in areas provided for frequent servicing. Gaskets and seals are therefore required to be an uninterrupted ring so that there will be no gaps in the assembled joint.

FIGURE 21 - GASKETS AND SEALS



DO YOU COMPLY

Gaskets and seals are continuous ring types? ( )

IT'S THE LAW

183.536 SEALS AND GASKETS IN FUEL FILTERS AND STRAINERS

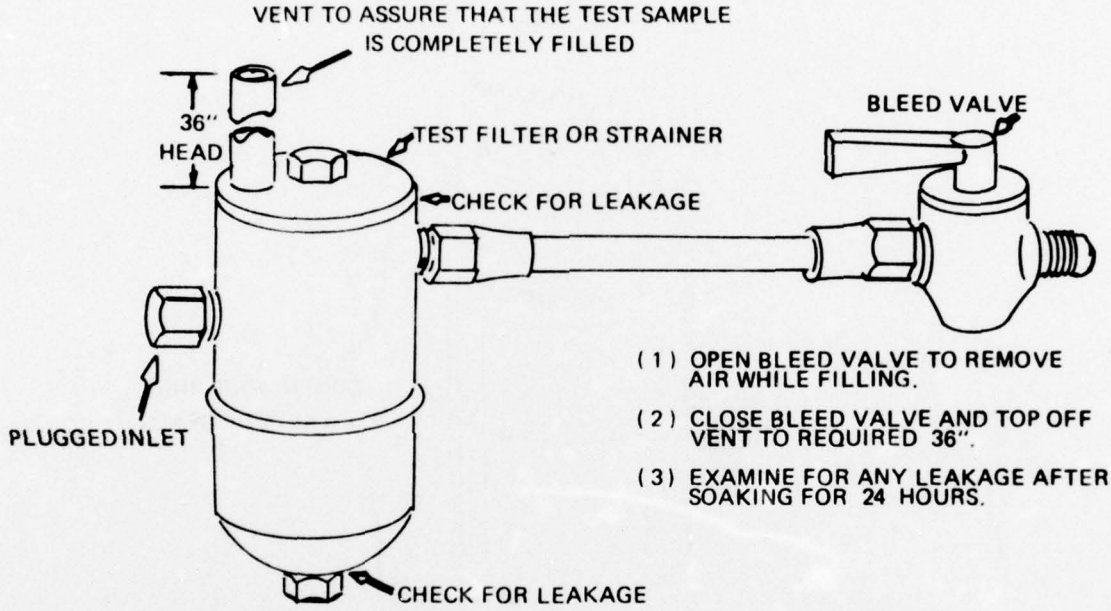
(b) Each gasket and each sealed joint in a fuel filter and strainer must not leak when subjected for 24 hours to a gasoline that has at least a 50 percent aromatic content at the test pressure determined under 183.582(a).

EFFECTIVE DATE: AUGUST 1, 1977

Fuel is made up of basic petroleum products in various quantities or concentrations. Depending on the amount of these components fuel may have varying effects on the materials used for gaskets and seals. Fuels with high aromatic content have been found to be damaging to fuel system components, such as gaskets, seals, hose and other usually non-metallic items.

To test gaskets and seals it is required to subject samples to gasoline with at least a 50 percent aromatic content for a period of 24 hours. The described fuel is to be placed in the filter or strainer at a minimum head of 3 feet. After the 24 hour period there shall be no leakage external to the tested unit.

FIGURE 22 - SEALS AND GASKETS LEAKAGE TEST



NOTE : THE BLEED VALVE MAY BE OMITTED IF THE OUTLET LINE TERMINATES AT THE SAME HEIGHT AS THE STANDPIPE.

DO YOU COMPLY

There is no leakage due to gasket or seal deterioration when tested to 183.536(b)? ( )

IT'S THE LAW

183.538 METALLIC FUEL LINE MATERIALS

Each metallic fuel line connecting the fuel tank with the fuel inlet connection on the engine must –

(a) be made of seamless annealed copper, nickel copper, or copper-nickel; and

(b) except for corrugated flexible fuel line, have a minimum wall thickness of 0.029 inches.

EFFECTIVE DATE: AUGUST 1, 1978

If metal is used for any portion of the fuel line (except for fittings) from the tank connection to the engine connection, usually at the fuel pump, the metallic fuel line portions must be seamless, annealed:

Copper
Nickel Copper (Monel)
Copper Nickel

No other metals are permitted.

Also the thickness of the tubing wall must be at least 0.029 inches unless the fuel line portion is a corrugated or accordion type of flexible fuel line. Tubing is available with thinner wall thicknesses, but they SHALL NOT be used.

Metal fuel lines used on the engine, i.e. the fuel line from the fuel pump to the carburetor, may be made of materials other than those listed. This line is usually supplied with the engine.

DO YOU COMPLY

Are metallic fuel lines made of seamless annealed:

Copper? ( )
Nickel Copper? ( )
Copper Nickel? ( )

Is the thickness of the fuel line tube wall at least 0.029 inches? ( )

IT'S THE LAW

183.540 HOSES: IDENTIFICATION

(a) Each "USCG Type A" hose and each "USCG Type B" hose must be identified by the manufacturer by a marking on the hose itself. If the complete text of the marking is not on a section of hose, the boat manufacturer must attach a tag that meets the requirements of paragraphs (b) and (c) of this section.

(b) Each marking and tag must contain the following information in English:

(1) The statement "USCG TYPE (insert A or B) HOSE".

(2) The year in which the hose was manufactured.

(3) The manufacturer's name or registered trademark.

(c) Each character must be block capital letters and numerals that are at least one-eighth inch high.

(d) Each marking must be permanent, legible, and on the outside of the hose at intervals of 12 inches or less.

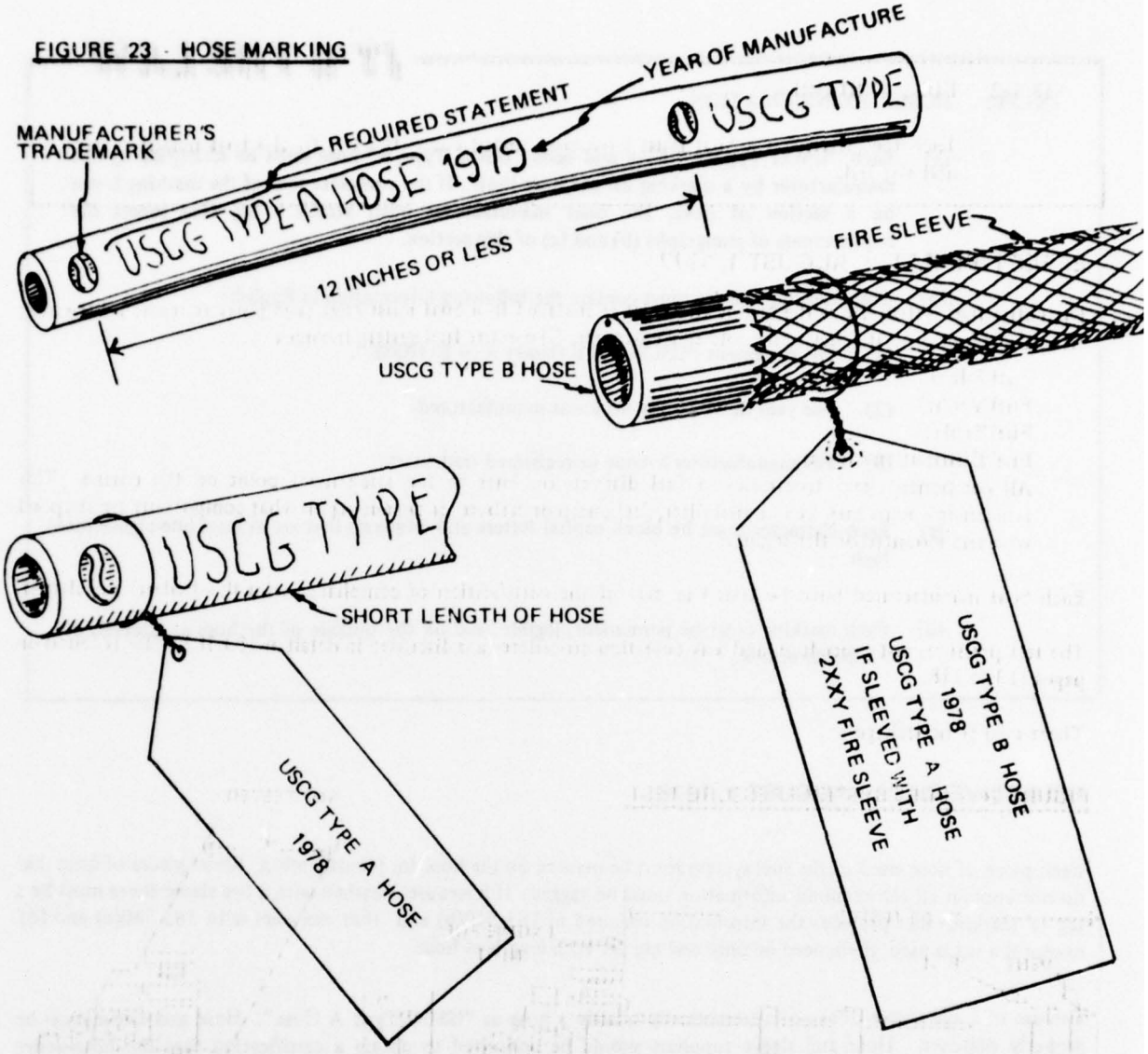
EFFECTIVE DATE: AUGUST 1, 1978

Each piece of hose used in the fuel system must be marked on the hose for identification. Short pieces of hose that do not contain all the required information must be tagged. If hoses are sheathed with a fire sleeve there must be a tag of marking that provides the information required in 183.540(b) and that complies with 183.540(c) and (d), except if a tag is used, there need be only one tag per each length of hose.

The use of a fire sleeve does not automatically qualify a hose as "USCG Type A Hose". Hose and sleeve must be properly matched. Hose and sleeve suppliers should be consulted to obtain a certification that the hose-sleeve combination will qualify as "USCG Type A Hose".

All lettering, numerals and trademarks used on hose or tags must be at least 1/8 inch high. Markings must be permanent, legible and on the outside of the hose. Hose markings must be repeated along the length of the hose so there is a complete marking within every 12 inch section of the hose except if a tag is used.

FIGURE 23 - HOSE MARKING



DO YOU COMPLY

Is the hose marked or tagged?	( )
Does the marking or tag contain all the following?	
(1) USCG Type (A or B) Hose	( )
(2) Year of Hose Manufacture	( )
(3) Manufacturer's Name or Trademark	( )
Are all the letters and numerals at least one-eighth inch high?	( )
Are the markings or tags:	
Permanent?	( )
Legible?	( )
In the English Language?	( )
On the Outside of the Hose?	( )
Are the marking intervals on the hose 12 inches or less?	( )

IT'S THE LAW

183.542 FUEL SYSTEMS

Each fuel system in a boat must have been tested under 183.582 by the boat manufacturer and not leak.

EFFECTIVE DATE: AUGUST 1, 1977

The entire fuel system up to the engine fuel inlet as installed in a boat must have been pressure tested by the boat manufacturer prior to the boat being sold to a customer. The entire fuel system includes:

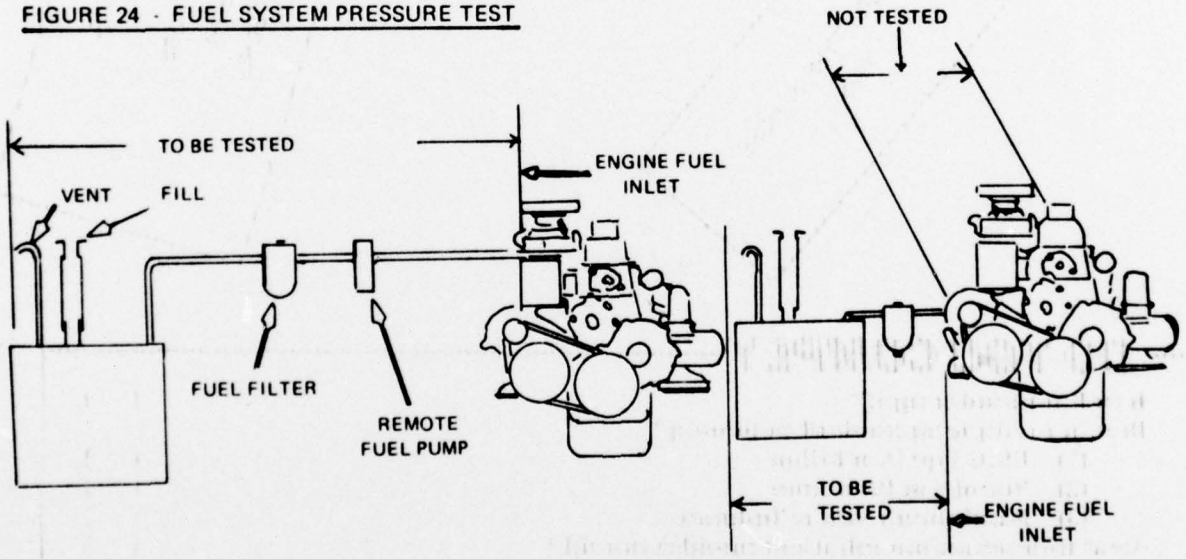
Fuel Fill(s)
Fuel Vent(s)
Fuel Tank(s)
Fuel Distribution Line(s)
All components and accessories in fuel distribution lines to the attachment point on the engine. This attachment point may be at a fuel filter, fuel pump or carburetor depending on what components are supplied with and mounted on the engine.

Each boat manufactured must be tested as part of the certification of compliance with this Federal Regulation.

The test pressure, test procedure, and leak detection procedures are discussed in detail in 183.582. This is found on pages 113 to 118.

There shall be no leakage.

FIGURE 24 - FUEL SYSTEM PRESSURE TEST



DO YOU COMPLY

The entire fuel system up to the engine fuel inlet has been tested. ( )
There is no leakage. ( )

MANUFACTURER REQUIREMENTS

FUEL TANKS

FUEL TANK ENCASEMENT

FUEL SYSTEM FITTINGS

PLUGS

HOSES

HOSE CLAMPS

FUEL LINES

FUEL TANK FILL

FUEL PUMPS

ANTI–SIPHON PROTECTION

FUEL FILTERS AND STRAINERS

GROUNDING

IT'S THE LAW

183.550 FUEL TANKS: INSTALLATION

(a) Each fuel tank must not be integral with any boat structure or mounted on an engine.

EFFECTIVE DATE: FEBRUARY 1, 1978

Each fuel tank intended to be permanently installed must be made as a separate component and then installed in the boat. Portions of a boat's structure, i.e. hull surfaces, bulkheads, stringers, floors, decks, frames, etc., may not form part of a fuel tank.

Fuel tanks glued or bonded in place or foamed-in-place are not considered integral and are therefore acceptable, but the installation must comply with the applicable portions of this regulation.

Fuel tanks may not be mounted on an engine, except if the engine is part of a portable piece of equipment that is not permanently installed in the boat. If a fuel tank is removed from an engine to be installed in the boat, the installation must comply with the requirements of this standard. Particular attention is directed to fuel tank vent requirements and the requirement for all openings to be in or at the topmost surface of the fuel tank. Many tanks installed on engines have a bottom fuel supply; this fuel tank is not acceptable for installation in a boat.

DO YOU COMPLY

Each fuel tank is not integral with any boat structure. ( )
There is no fuel tank mounted on a permanently installed engine. ( )

IT'S THE LAW

183.550 FUEL TANKS: INSTALLATION

(b) Each fuel tank must not move at the mounting surface more than one-fourth inch in any direction.

EFFECTIVE DATE: FEBRUARY 1, 1978

The basic intent of this requirement is to restrict the movement of an installed fuel tank with respect to its mounting surfaces, to a minimum amount. No movement would be best. To establish a quantitative test, one-fourth inch in any direction has been selected.

DO YOU COMPLY

The tank cannot move more than one-fourth inch in any direction measured at its mounting surface. ( )

IT'S THE LAW

183.550 FUEL TANKS: INSTALLATION

(c) **Each fuel tank must not support a deck, bulkhead, or other structural component.**

EFFECTIVE DATE: FEBRUARY 1, 1978

A fuel tank is not permitted to be a structural part of a boat to the extent that it provides the main support for a deck, bulkhead or other boat structure. To determine whether the intent of this regulation is met the following question must be answered in the affirmative. Is the deck, bulkhead or other structural component properly supported to function as intended with the fuel tank removed? If not the tank is providing support that is not acceptable.

It is not intended to prohibit incidental contact of a deck or hatch with a fuel tank or the use of protective covers or panels for fuel tanks.

DO YOU COMPLY

The fuel tank does not support a deck, bulkhead or other structural component of the boat. ( )

IT'S THE LAW

183.550 FUEL TANKS: INSTALLATION

(d) **Water must drain from the surface of each metallic fuel tank when the boat is in its static floating position.**

EFFECTIVE DATE: FEBRUARY 1, 1978

Metallic fuel tanks must be designed, installed or provision made to drain water from its surface when the boat is in its "static floating position" (See 183.505 for definition of "static floating position"). It is recognized that irregularities in the top surface of a flat topped fuel tank may be able to retain water by surface tension. The intent of this requirement is to prevent the entrapment of water such as may occur with lipped edges or saucer type tops on fuel tanks.

Foamed in place metallic (must be non-ferrous) fuel tanks must be installed with provisions to prevent water from collecting on top of the metal surface of the fuel tank such as might occur if the foam formed a basin around the fuel tank fittings. An alternate method is to coat the metal fuel tank surface with a barrier coating other than paint which will effectively prevent water from contacting the metal surface.

DO YOU COMPLY

Water will drain from the metallic fuel tank surface when the boat is in its "static floating position" or is effectively coated to prevent water from contacting the metal surface. ( )

IT'S THE LAW

183.550 FUEL TANKS: INSTALLATION

(e) **Each fuel tank support, chock, or strap that is not integral with a metallic fuel tank must be insulated from the tank surface by a non-moisture absorbing material.**

EFFECTIVE DATE: FEBRUARY 1, 1978

Unless a metallic fuel tank has a built-in means for supporting and holding the fuel tank in place a non-moisture absorbing material must be placed between the fuel tank surface and the support, chock or strap. The non-moisture absorbing quality of the material is necessary to prevent localized corrosion of the fuel tank that might occur if moisture was trapped at the support-tank interface for prolonged periods of time.

The following Table lists some materials that appear to be suitable and some that should be avoided. Care should be taken to avoid abrasive combinations of materials even though it is not a mandated requirement of the regulation.

Basically this requirement provides for the isolation of the metallic fuel tank from a potentially moisture laden support system and also from abrasion by the supports, chocks and straps.

TABLE II

FUEL TANK ISOLATION MATERIALS

SUITABLE	UNSUITABLE
Neoprene	Foams
Teflon	Carpeting
High Density Plastics	Cardboard
	Felt
	Unpainted Wood
	Canvas

NOTE: These lists are not limiting in the materials to be included. They are to establish the intent of the regulatory requirement prohibiting moisture absorbent materials.

DO YOU COMPLY

The fuel tank supports, chocks or straps are integral with the fuel tank? ( )

OR

If tank supports, chocks or straps are not integral, they are insulated from the fuel tank by non-moisture absorbing material? ( )

IT'S THE LAW

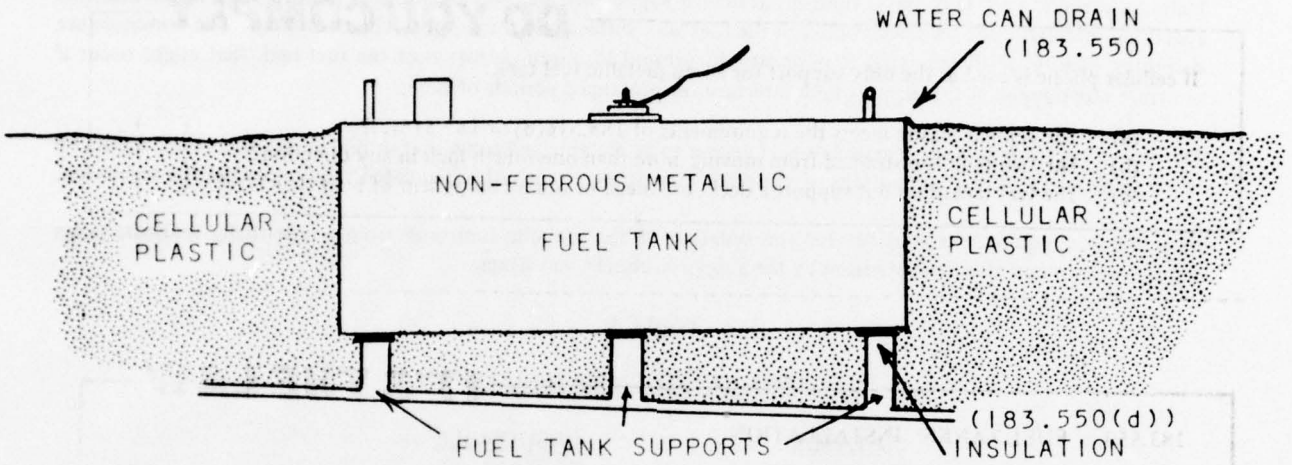
183.550 FUEL TANKS: INSTALLATION

(f) **Cellular plastic must not be the sole support for a metallic fuel tank.**

EFFECTIVE DATE: FEBRUARY 1, 1978

Non-ferrous metallic fuel tanks may be foamed in place, (See 183.512(c)), if the installation provides support for the fuel tank that is independent of the cellular plastic. Supports for metallic fuel tanks must be in accordance with Section 183.550(e). The installation must comply with all applicable sections of 183.550 particularly (b), (c) and (d). It is recognized that the cellular plastic, upon curing, will assume some of the support for the tank and this is acceptable.

FIGURE 25 - FOAMED-IN-PLACE NON-FERROUS METALLIC TANK



DO YOU COMPLY

If cellular plastic is used to install a metallic fuel tank:

(a)	The fuel tank is of non-ferrous metal?	( )
(b)	The fuel tank is supported independently?	( )
(c)	Water can drain from the fuel tank's surface?	( )
(d)	Fuel tank supports, chocks or straps are insulated from the fuel tank surface, unless they are integral, with a non-moisture absorbing material?	( )
(e)	The fuel tank does not support a deck, bulkhead or other component of boat structure?	( )
(f)	The fuel tank is restrained from moving more than one-fourth inch in any direction?	( )

IT'S THE LAW

183.550 FUEL TANKS: INSTALLATION

(g) If cellular plastic is the sole support of a non-metallic fuel tank, the cellular plastic must meet the requirements of 183.516 (b) or (c).

EFFECTIVE DATE: FEBRUARY 1, 1978

Cellular plastic may provide the only support for non-metallic fuel tanks. Fiberglass reinforced plastic fuel tanks and other suitable plastics used for fuel tanks may be installed in cellular plastic. In order to use cellular plastic as the only support for these non-metallic fuel tanks the cellular plastic must meet or exceed the requirements of Section 183.516(b) for non-polyurethane cellular plastic (compressive strength of at least 60 pounds per square inch at 10 percent deflection) or 183.516(c) for polyurethane cellular plastic (density of at least 3.2 pounds per cubic foot). Refer to the discussion of these sections for further information about these properties required of the cellular plastic. This discussion is on pages 36 and 37.

DO YOU COMPLY

If cellular plastic is used as the only support for a non-metallic fuel tank:

(a) The cellular plastic meets the requirements of 183.516(b) or 183.516(c)? ( )
(b) The fuel tank is restrained from moving more than one-fourth inch in any direction? ( )
(c) The fuel tank does not support a deck, bulkhead or other component of boat structure? ( )

IT'S THE LAW

183.550 FUEL TANKS: INSTALLATION

(h) Each fuel tank labeled under 183.514(b)(8) for installation aft of the boat's half length must be installed with its center of gravity aft of the boat's half length.

EFFECTIVE DATE: FEBRUARY 1, 1978

Fuel tanks whose label states:

"MUST BE INSTALLED AFT OF THE BOAT'S HALF-LENGTH"

are to be installed with the fuel tank's center of gravity toward the stern of the mid-length of the boat. These fuel tanks have been qualified at a lower strength criteria then those fuel tanks capable of installation at any location in a boat. The shock loading or impacts felt by boats are more severe in the forward portion of a boat than in the aft half. Therefore fuel tanks that are meant for installation anywhere must be tested at, at least 25g accelerations in accordance with Section 183.584(e)(1), or must be tested in accordance with 183.586 or both 183.586 and 183.588 depending on the fuel tank capacity. Fuel tanks intended for installation aft of the boat's half-length may be tested at 15g accelerations in accordance with Section 183.584(e)(2) if its capacity is less than 25 gallons. Table III shows the strength tests for fuel tanks according to their capacity and location in a boat.

TABLE III

STRENGTH TESTS FOR FUEL TANKS

CAPACITY	STRENGTH TESTS		
	SHOCK	PRESSURE–IMPULSE	SLOSH
Fuel Tank Located Anywhere in Boat			
Less than 25 gallons	183.584 [use (e)(1)	–	–
25 to less than 100 gallons	–	183.586	–
100 gallons or more	–	183.586	183.588
Fuel Tank's Center of Gravity Aft of Half-Length			
Less than 25 gallons	183.584 [use (e)(2)	–	–
25 to less than 100 gallons	–	183.586	–
100 gallons or more	–	183.586	183.588

DO YOU COMPLY

Is the fuel tank marked:

"MUST BE INSTALLED AFT OF THE BOAT'S HALF LENGTH"? ( )

If the fuel tank is so marked, is its center of gravity located aft of the boat's half-length? ( )

IT'S THE LAW

183.552 PLASTIC ENCASED FUEL TANKS: INSTALLATION

(a) Each fuel tank encased in cellular plastic foam or in fiber reinforced plastic must have the connections, fittings, and labels accessible for inspection and maintenance.

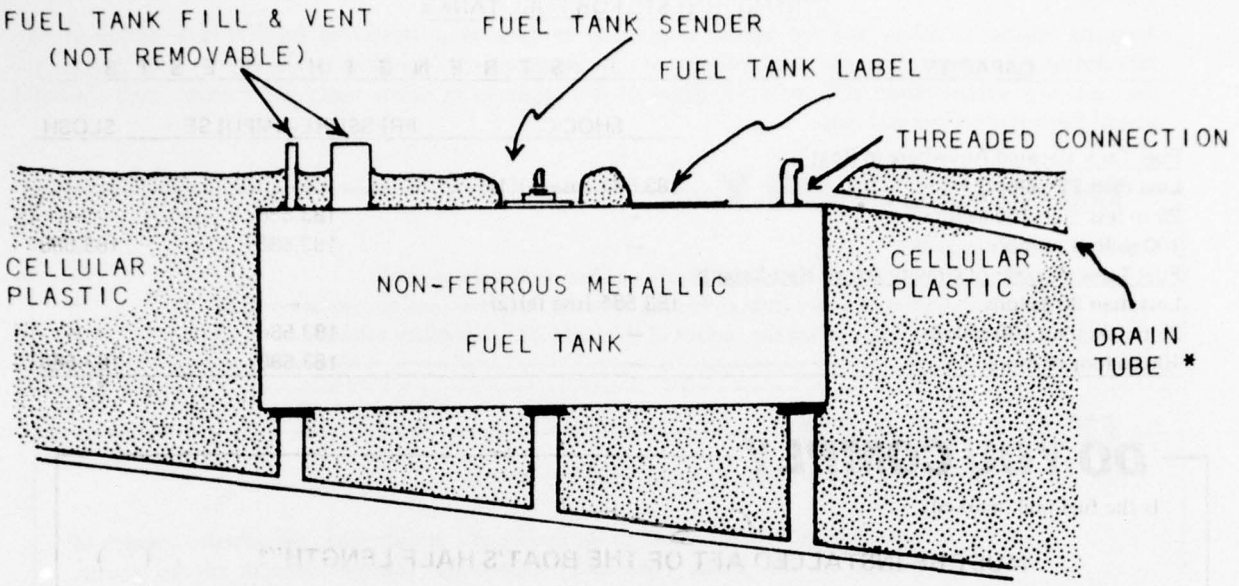
EFFECTIVE DATE: AUGUST 1, 1978

The connections at the tank for the fuel tank fill, fuel tank vent, fuel distribution fittings, fuel level gage and the FUEL TANK LABEL must all be located to be available for inspection and servicing when using cellular plastic foam or fiberglass for the fuel tank installation.

If the fuel tank connections are welded to the fuel tank, then the top of the fuel tank may be covered with cellular plastic. If the fuel tank connections are screw type spuds in the fuel tank surface then these joints must be accessible.

Accessibility may be achieved by removable panels, hatches, access ports and boat components. Seats, fish boxes and consoles that are designed so they may be removed also provide accessibility.

FIGURE 26 - ENCASED FUEL TANK CONNECTIONS, FITTINGS AND LABELS ACCESSIBILITY



* NOTE : DRAIN TUBES ARE REQUIRED UNLESS THE FUEL TANK SURFACE IS NON-METALLIC OR PROTECTED WITH FIBERGLASS.

DO YOU COMPLY

Is the fuel tank encased in cellular plastic or fiber reinforced plastic? ( )
If so, are the fuel tank connections, fittings and label accessible for inspection and maintenance? ( )

IT'S THE LAW

183.552 PLASTIC ENCASED FUEL TANKS: INSTALLATION

(b) If a metallic fuel tank is encased in cellular plastic or in fiber reinforced plastic, water must not collect between the plastic and the surface of the tank or be held against the tank by capillary action.

EFFECTIVE DATE: AUGUST 1, 1978

Encased metallic fuel tanks (only non-ferrous permitted) might corrode in the presence of stagnant moisture. This moisture could be held against a fuel tank surface by tight fitting, slip-in cellular plastic blocks or other plastic materials not properly bonded to the fuel tank surfaces. (See 183.552(c))

Unless the encasement materials are bonded to the fuel tank surfaces there must be an air space between the fuel tank surface and the encasement materials so water will run off. This space must be sufficient to prevent water droplets from bridging the space and being held against the tank by capillary action. One-fourth inch minimum

clearance has proven satisfactory in many installations, however in installations where this may be a problem a typical installation should be evaluated.

Supports, chocks or straps and the insulation material between these items and the fuel tank surface are not included in this requirement. (See 183.550(e)) An intervening plastic film between the encasement materials and the fuel tank surface does NOT meet the intent of this requirement unless water is prevented from collecting against the surface of the fuel tank.

DO YOU COMPLY

Is the fuel tank metallic? ( )
Is this metallic fuel tank encased in cellular plastic or fiber reinforced plastic? ( )
Does the installation prevent water from collecting between the plastic and the surface of the fuel tank or from being held against the surface of the fuel tank by capillary action? ( )

IT'S THE LAW

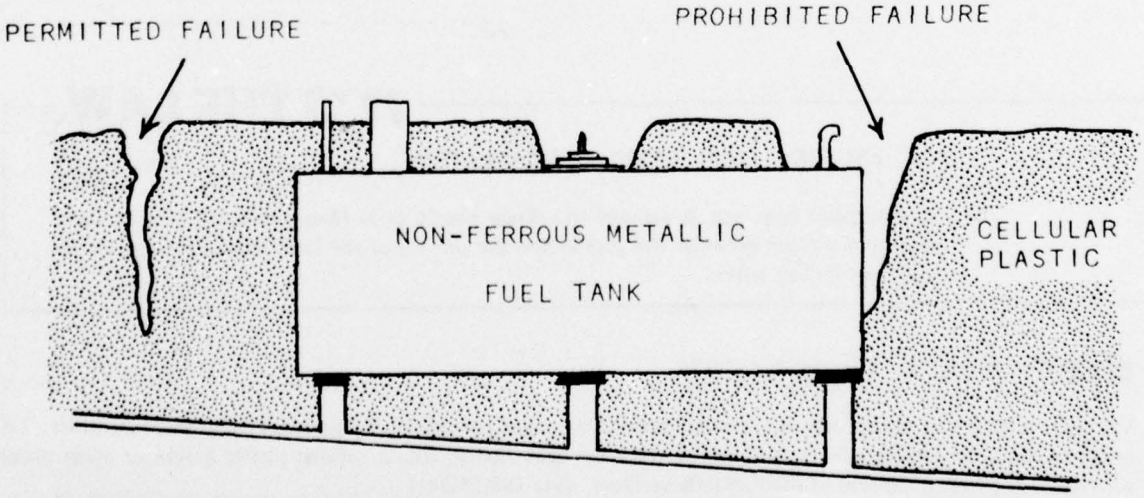
183.552 PLASTIC ENCASED FUEL TANKS: INSTALLATION

(c) If the cellular plastic is bonded to the surface of a metallic tank, the adhesive strength of the metal to the plastic bond must exceed the cohesive strength of the plastic.

EFFECTIVE DATE: AUGUST 1, 1978

Encasement of metallic (only non-ferrous permitted) fuel tanks must be done carefully to avoid accelerated corrosion. The adhesion of the encasement materials to the surface of the fuel tank must prevent water or moisture from contacting the fuel tank's metallic material. This is the reason for the cohesive strength of the plastic to be less than the adhesive bond to the fuel tank. This is to say that, if a failure of the encasement material is to occur it should fail within the encasement material and not pull away from the surface of the fuel tank.

FIGURE 27 - FAILURE OF ENCASEMENT MATERIALS



DO YOU COMPLY

Should a failure occur to encasement material used with metallic fuel tanks the failure will not occur at the joint to the surface of the fuel tank. ( )

IT'S THE LAW

183.554 FITTINGS, JOINTS, AND CONNECTIONS

Each fuel system fitting, joint, and connection must be arranged so that it can be reached for inspection, removal, or maintenance without removal of permanent boat structure.

EFFECTIVE DATE: FEBRUARY 1, 1978

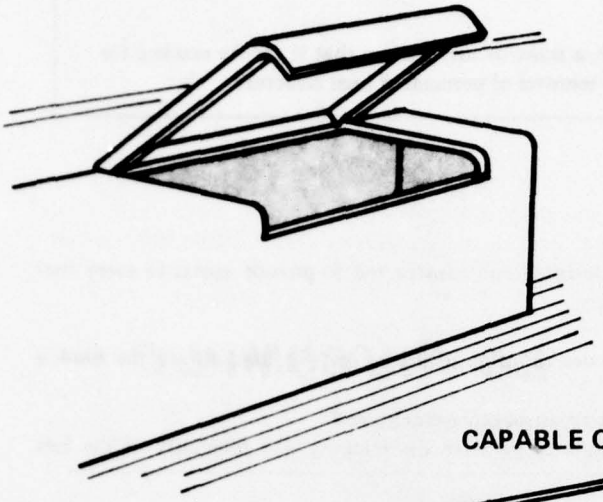
The fuel system must be installed and the boat must be designed and constructed to provide access to every fuel system fitting, joint and connection. This access must permit:

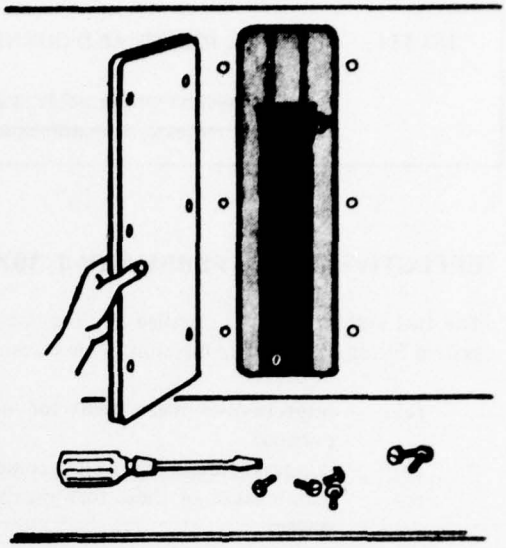
(a) – inspection of these items for leakage and deterioration, (mirrors may be used to see the hidden portion).
(b) – removal of these fuel system components for repair or replacement, and
(c) – maintenance of these fuel system components to preserve the integrity and reliability of the fuel system.

This requirement doesnot apply to fuel tanks or uninterrupted runs of fuel lines, only to their fittings, joints and connections. Access may be gained by means of removable panels, hatches, ports, doors, removable seats, removable consoles or other means designed for such access. It is intended that these items can be reached without cutting portions of the boat.

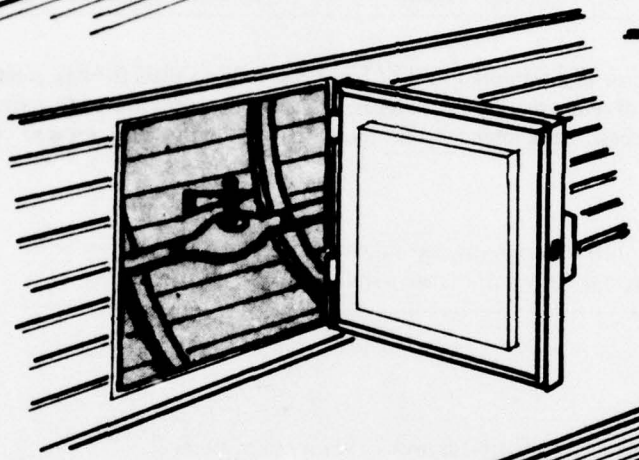
Figure 28 depicts typical means of access.

FIGURE 28 – EXAMPLES OF ACCESSIBILITY

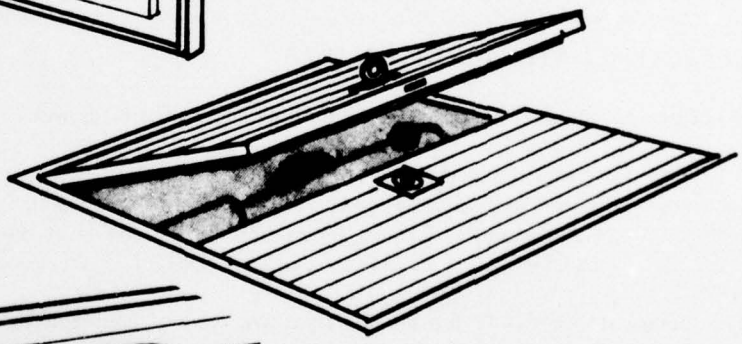




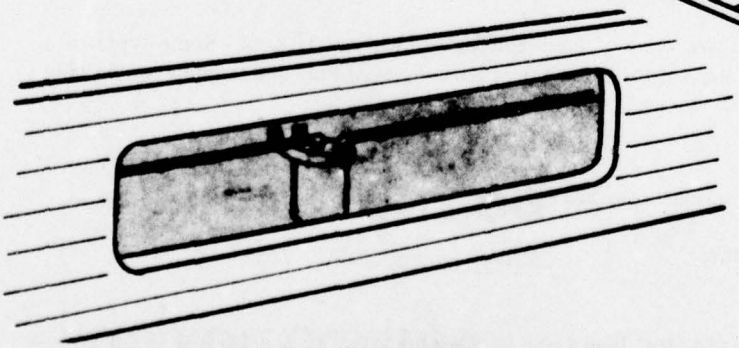
CAPABLE OF



BEING REACHED FOR INSPECTION, REMOVAL



OR MAINTENANCE WITHOUT REMOVAL OF



PERMANENT BOAT STRUCTURE(S)

DO YOU COMPLY

Each fittings, joint and connection in the fuel system can be reached for inspection, removal or maintenace without removal or damage to permanent boat structure. ( )

IT'S THE LAW

183.556 PLUGS AND FITTINGS

(a) A fuel system must not have a fitting for draining fuel.

EFFECTIVE DATE: AUGUST 1, 1977

There shall be no fitting or component in the fuel system whose purpose is to drain fuel from the fuel system. Fuel tank drains, valves or plugged tee fittings in fuel lines and drain or bleed valves at engine connections are all prohibited.

DO YOU COMPLY

Except as provided in 183.556(b) there is no fuel drain in the fuel system.

IT'S THE LAW

183.556 PLUGS AND FITTINGS

(b) A plug used to service the fuel filter or strainer must have a tapered pipe-thread or be a screw type fitted with a locking device other than a split lock washer.

EFFECTIVE DATE: AUGUST 1, 1977

Fuel filters and strainers may have a servicing plug or screw fitting however they must be either:

(a) – a tapered pipe-thread type of plug, or
(b) – a screw type of plug incorporating or provided with a locking means other than a split lock washer. Gaskets and seals must be an unsplit ring and must meet the leakage prohibition required by 183.536(b).

The locking device should provide for repetitive removal and replacement without leakage. Some types of a locking device, such as a star lock washer, can damage surfaces upon repetitive disassembly and assembly potentially affecting the ability of the filter or strainer to remain leakproof.

DO YOU COMPLY

The servicing plug for a filter or strainer is either:

(a) – a tapered pipe-thread, or ( )
(b) – a screw type with a locking device other than a split lock washer. ( )

IT'S THE LAW

183.558 HOSES AND CONNECTIONS

(a) Each hose between the fuel pump and the carburetor must be "USCG Type A" hose.

EFFECTIVE DATE: AUGUST 1, 1978

If a hose is used in the fuel line running between the fuel pump and the carburetor the hose must be "USCG Type A Hose" and so labeled as required by 183.540. This requirement is applicable whether the fuel pump is engine mounted or mounted remote from the engine as permitted by 183.566.

This requirement does not apply to a tube used to detect fuel pump diaphagm failure.

DO YOU COMPLY

Any hose used between the fuel pump and the carburetor is "USCG Type A Hose". **( )**

IT'S THE LAW

183.558 HOSES AND CONNECTIONS

(b) Each hose used for a vent line or fill line and each hose from the fuel tank to the fuel inlet connection on the engine must be –

(1) "USCG Type A" hose; or

(2) "USCG Type A" or "USCG Type B" hose, if no more than five ounces of fuel is discharged in 2 1/2 minutes when –

(i) the hose is severed at the point where maximum drainage of fuel would occur,

(ii) the boat is in its static floating position, and

(iii) the fuel system is filled to the capacity marked on the tank label under 183.514(b)(3).

EFFECTIVE DATE: AUGUST 1, 1978

The selection of the type of hose to be used in a fuel system is evaluated in accordance with the following:

(a) The boat must be in its "static floating position" as defined by 183.505.
(b) The fuel system is filled to the capacity marked on the fuel tank label as required by 183.514(b)(3). Normally this quantity of fuel may fill the fuel tank to its topmost surface but will not fill the fuel tank fill or vent lines. Fuel is required to fill the fuel distribution line to the carburetor connection in order to determine the quantity of fuel that will leak in 2 1/2 minutes if a hose is severed.

Table IV shows the lengths of hose or tubing of various diameters, that if filled with fuel will contain five ounces. You will see that only a short portion of fuel fill or vent hose filled with fuel will require that hose to be"USCG Type A Hose". Most fuel fill and fuel tank vent installations will permit the use of "USCG Type B Hose" but

particular care must be taken if the fuel fill line and/or fuel tank vent line are run horizontally from the fuel tank connection. Any dips below the topmost surface of a fuel tank may cause a need for "USCG Type A Hose".

To determine what type of hose may be used for the fuel distribution line it is necessary to:

(a) – determine where in the hose portion of the fuel line that the maximum drainage could occur.
(b) – cut the hose at the maximum drainage point. The intent is to cut the hose completely through and then support the hose at both sides of the cut at their original location.
(c) – measure the fuel leakage from this opening in the fuel hose for a period of 2 1/2 minutes. If more than five ounces-use "USCG Type A Hose". If less than five ounces-you may use "USCG Type B Hose".

"USCG Type A Hose" may be used for all hose portions regardless of whether the installation proves that "USCG Type B Hose" is acceptable. If "USCG Type A Hose" is used then there is no need to test for five ounces of fuel leakage in 2 1/2 minutes.

TABLE IV

LENGTHS OF HOSES VS FIVE OUNCE FUEL CAPACITY

Hose Inside Diameter	Length–Inches
1/4	183.85
5/16	117.67
3/8	81.71
7/16	60.03
1/2	45.96
9/16	36.30
5/8	29.42
3/4	20.43
1	11.49
1 1/4	7.35
1 1/2	5.11
2	2.87

DO YOU COMPLY

Are all fuel line hoses "USCG Type A Hose". ( )
If not:
(a) Place the boat in its "static floating position" (See 183.505). ( )
(b) Fill the fuel system to the capacity marked on the fuel tank label. ( )
(c) Cut the hose portion of the fuel line at its maximum drainage point. ( )
(d) Measure the fuel leakage in 2 1/2 minutes. ( )
If less than five ounces of fuel leaks in 2 1/2 minutes, "USCG Type B Hose" may be used. ( )
If more than five ounces of fuel leaks in 2 1/2 minutes, use "USCG Type A Hose" or reroute the fuel lines to comply. ( )

IT'S THE LAW

183.558 HOSES AND CONNECTIONS

(c) Each hose must be secured by –

(1) a swaged sleeve;

(2) a sleeve and threaded insert; or

(3) a hose clamp.

EFFECTIVE DATE: AUGUST 1, 1978

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

Hose connections may be made by one of the following means:

(a) SWAGED SLEEVE – This type of connection is usually made by the supplier of a hose assembly since special machinery or apparatus is necessary to perform the swaging operation. The attachment to the fuel system is usually made by means of a threaded hose fitting.

(b) SLEEVE AND THREADED INSERT – This type of connection usually can be made by an installer using normal shop tools. Usually the sleeve is placed on the outside of the hose and the threaded insert screwed into the inside of the hose and sleeve. There are also connections in which the sleeve is installed on the hose after the insert is installed. The attachment to the fuel system is usually made by means of a threaded hose fitting.

(c) HOSE CLAMP – This type of connection is usually made upon installation using normal shop tools. The device usually has a mechanically operated tightening mechanism such as a screw or bolt but may require a specific means of deformation to secure the connection. A hose clamp is usually slipped on each end of the hose in a loosened condition, the hose installed and the hose clamp tightened. The attachment to the fuel system is usually made by means of a beaded, flared or serrated spud, pipe or hose fitting.

NOTE: Wire types of hose clamps are not acceptable.

DO YOU COMPLY

Are all hoses secured? ( )

Is the securing device one of the following?

(a) A swaged sleeve ( )

(b) A sleeve and threaded insert ( )

(c) A hose clamp ( )

IT'S THE LAW

183.558 HOSES AND CONNECTIONS

(d) The inside diameter of a hose must not exceed the actual minor outside diameter of the connecting spud, pipe, or fitting by more than the distance shown in Table 8.

TABLE 8

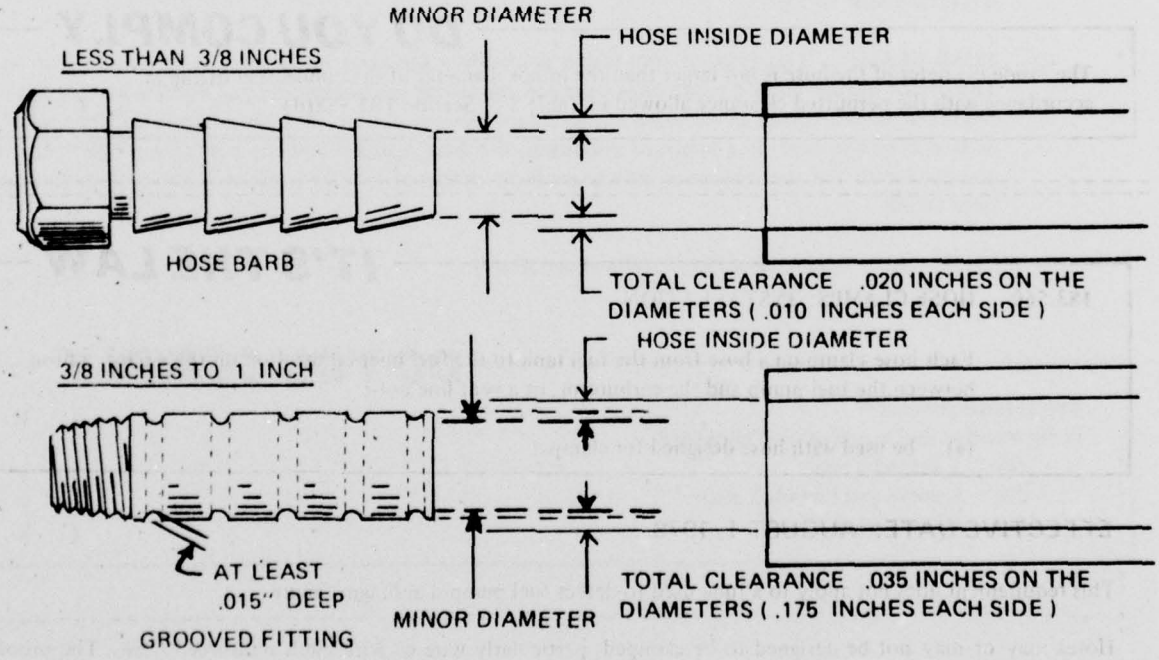
If minor outside diameter of the connecting spud, pipe, or fitting is:	The inside diameter of the hose must not exceed the minor outside diameter of the connecting spud, pipe, or hose fitting by more than the following distance:
Less than 3/8 inch	0.020 inch
3/8 inch to 1 inch	0.035 inch
Greater than 1 inch	0.065 inch

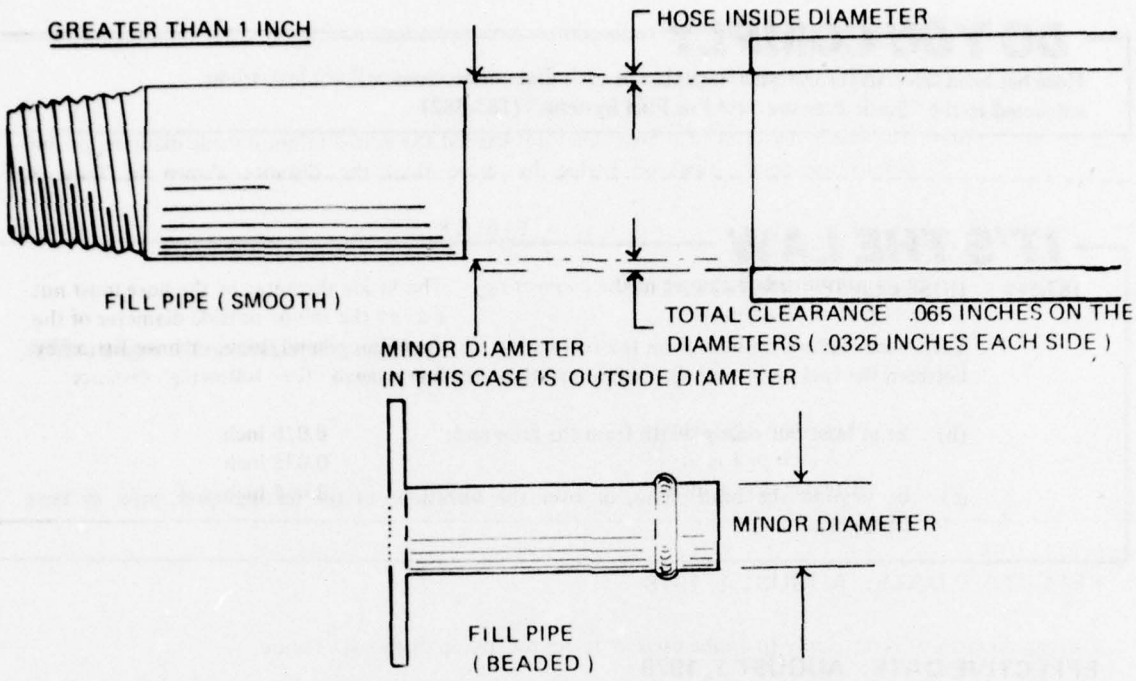
EFFECTIVE DATE: AUGUST 1, 1978

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

To assure a leakproof hose connection certain permitted hose to spud clearances have been established. Figure 29 depicts these clearances as applied to some spuds, pipes or fittings.

FIGURE 29 - HOSE CONNECTIONS





NOTE: Hose connections using hose clamps must comply with 183.530 which requires a bead, a flare or a series of annular grooves or serrations at least .015 inches deep, on the connecting fitting. Fuel tank fill pipe connections may be made on smooth pipe.

DO YOU COMPLY

The inside diameter of the hose is not larger than the minor diameter of the connecting fitting in accordance with the permitted clearance allowed in Table 8 of Section 183.558(d). ( )

IT'S THE LAW

183.560 HOSE CLAMPS: INSTALLATION

Each hose clamp on a hose from the fuel tank to the fuel inlet connection on the engine, a hose between the fuel pump and the carburetor, or a vent line must –

(a) be used with hose designed for clamps;

EFFECTIVE DATE: AUGUST 1, 1978

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

Hoses may or may not be designed to be clamped, particularly wire or wire mesh reinforced hose. The proof of whether a hose is satisfactory is that the hose connection not leak when subjected to the "Static Pressure Test For Fuel Systems" (183.582) as required by 183.542.

DO YOU COMPLY

Hose has been selected for use with hose clamps such that connections will not leak when subjected to the "Static Pressure Test For Fuel Systems" (183.582). ( )

IT'S THE LAW

183.560 HOSE CLAMPS: INSTALLATION

Each hose clamp on a hose from the fuel tank to the fuel inlet connection on the engine, a hose between the fuel pump and the carburetor, or a vent line must –

(b) be at least one clamp width from the hose end;

(c) be beyond the bead, flare, or over the serrations of the mating spud, pipe, or hose fitting; and

EFFECTIVE DATE: AUGUST 1, 1978

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

Any hose to be used with hose clamps and is installed in;

(a) – the fuel tank vent line
(b) – the fuel line between the fuel pump and the carburetor, or
(c) – the fuel distribution line between the fuel tank and the fuel inlet connection at the engine (this connection is many times at the fuel pump)

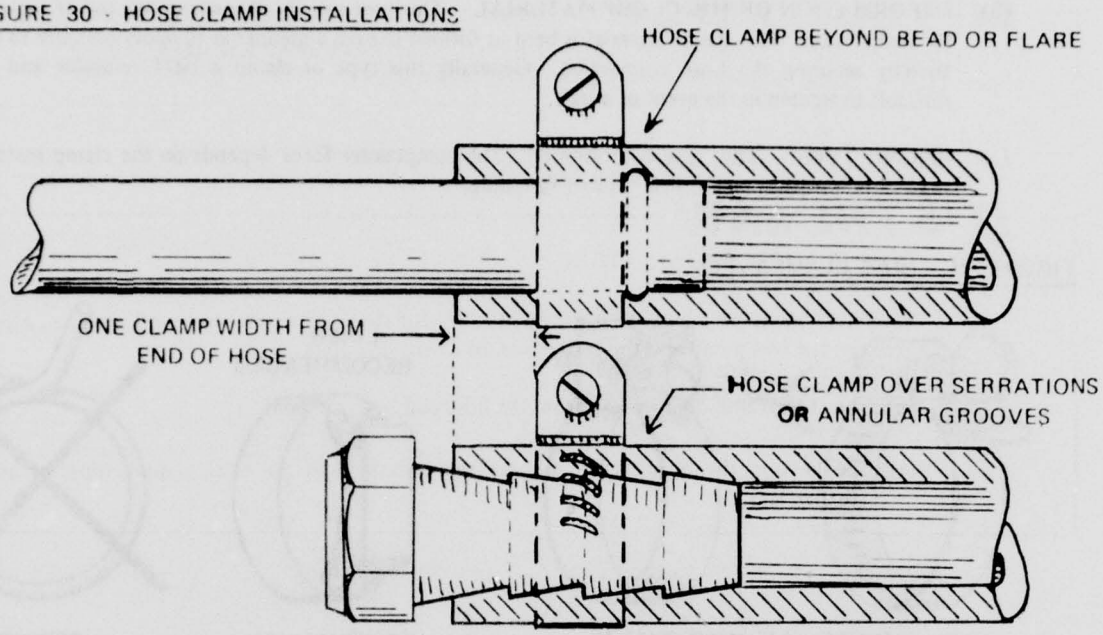
is required to be assembled with the hose clamp;

(a) – at least one clamp width from the end of the hose, and
(b) – beyond a bead or flare, or
(c) – over serrations or annular grooves (183.530)

NOTE: Wire types of hose clamps are not acceptable.

Figure 30 shows some satisfactory installations.

FIGURE 30 - HOSE CLAMP INSTALLATIONS



DO YOU COMPLY

The hose clamp is at least one clamp width from the end of the hose. ( )
The hose clamp is beyond a bead or flare, or over serrations or annular grooves. ( )

IT'S THE LAW

183.560 HOSE CLAMPS: INSTALLATION

Each hose clamp on a hose from the fuel tank to the fuel inlet connection on the engine, a hose between the fuel pump and the carburetor, or a vent line must –

(d) not depend solely on the spring tension of the clamp for compressive force.

EFFECTIVE DATE: AUGUST 1, 1978

This requirement does not apply to a tube used to detect fuel pump diaphragm failure.

Hose clamps are available that use different means for securing the hose to the hose fitting, pipe or spud.

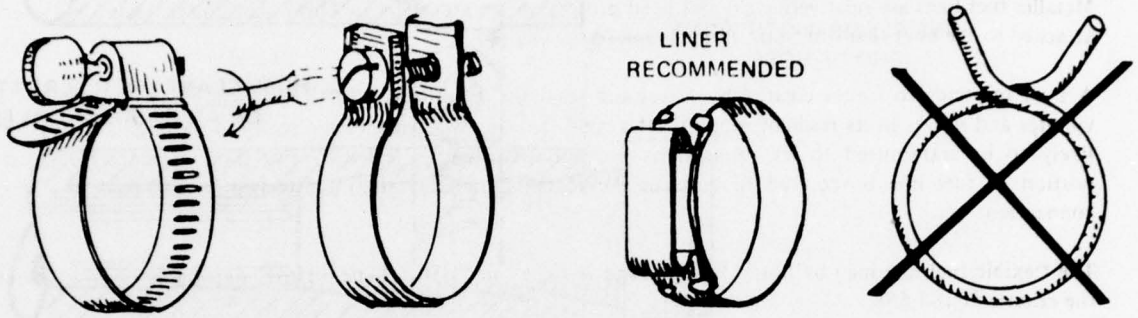
(a) MECHANICAL TIGHTENING – This type employs a screw or bolt to apply pressure to the connection. A screw driver, pliers or wrench is used to adjust the hose clamp depending upon the adjustment configuration. These clamps are re-usable.

NOTE: Wire types of hose clamps are not acceptable.

(b) DEFORMATION OF THE CLAMP MATERIAL – This type usually depends on the use of a special tool for installation. The clamp material is bent or formed in such a manner as to apply pressure to the hose thereby securing the hose connection. Generally this type of clamp is **NOT** re-usable and may be difficult to tighten in the event of a leak.

(c) SPRING TYPE – This type is prohibited. The compressive force depends on the clamp material and there is no positive, mechanical type of fastening.

FIGURE 31 - HOSE CLAMP TYPES



MECHANICAL TIGHTENING | DEFORMATION | SPRING

DO YOU COMPLY

Hose clamps rely on a means of tightening other than spring tension of the clamp. ( )

IT'S THE LAW

183.562 METALLIC FUEL LINES

(a) Each metallic fuel line that is mounted to the boat structure must be connected to the engine by a flexible fuel line.

EFFECTIVE DATE: AUGUST 1, 1977

Metallic fuel lines are relatively rigid and need protection from vibration. This is particularly true for the fuel lines attached to the boat that run from the fuel tank to the engine.

A boat responds to forces created by waves and resultant pounding by the hull twisting and moving. An engine vibrates and moves in its resilient mounts. If a rigid fuel line was connected directly to the engine unusual stress is likely to be transmitted to its connections probably resulting in leakage. For these considerations a flexible portion of fuel line is required to connect the metallic fuel line that is attached to the boat, to the engine connection.

The flexible fuel line may be hose, "USCG Type A Hose" or "USCG Type B Hose" depending on compliance with the criteria of 183.558.

DO YOU COMPLY

If a metallic fuel line is used there is a flexible fuel line connecting this line to the engine. ( )

IT'S THE LAW

183.562 METALLIC FUEL LINES

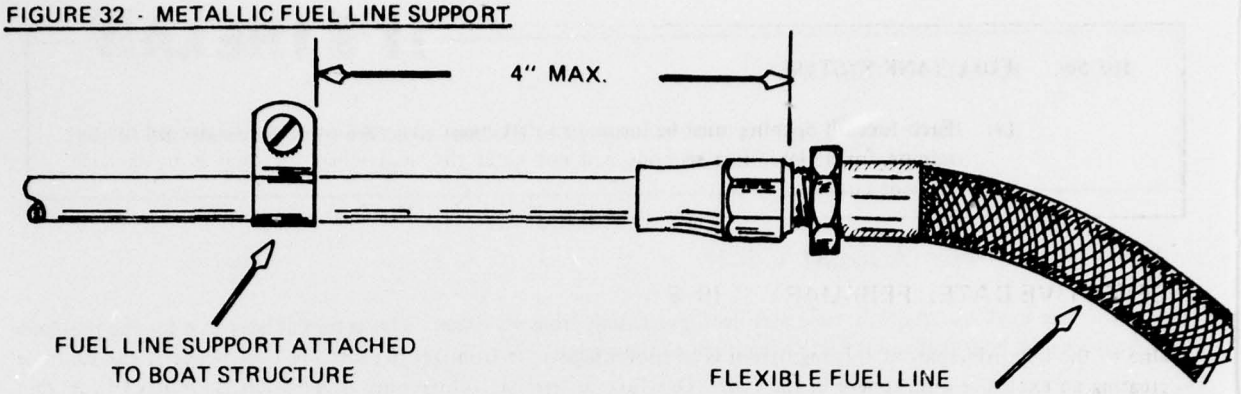
(b) Each metallic fuel line must be attached to the boat's structure within four inches of its connection to a flexible fuel line.

EFFECTIVE DATE: AUGUST 1, 1977

To prevent damaging stresses on the metallic fuel line at the connection of the flexible fuel line, there must be a means of support for the metallic fuel line within four inches of said connection. This support must be installed wherever a flexible fuel line is used and attached to a metallic fuel line.

Figure 32 diagrams this support.

FIGURE 32 - METALLIC FUEL LINE SUPPORT



DO YOU COMPLY

There is support for metallic fuel lines within four inches of a connection to a flexible fuel line. ( )

IT'S THE LAW

183.564 FUEL TANK SYSTEM

(a) Each fuel fill opening must be located so that a gasoline overflow of up to five gallons per minute for at least five seconds will not enter the boat when the boat is in its static floating position.

EFFECTIVE DATE: FEBRUARY 1, 1978

One of the key principles of this regulation is to prevent gasoline from getting inside a boat where it can vaporize creating an explosive atmosphere in the boat. Overflow at the fuel fill opening is one potential source of fuel that could get inside a boat unless precautions are taken.

The location of the fuel tank fill opening must be chosen keeping the following considerations in mind:

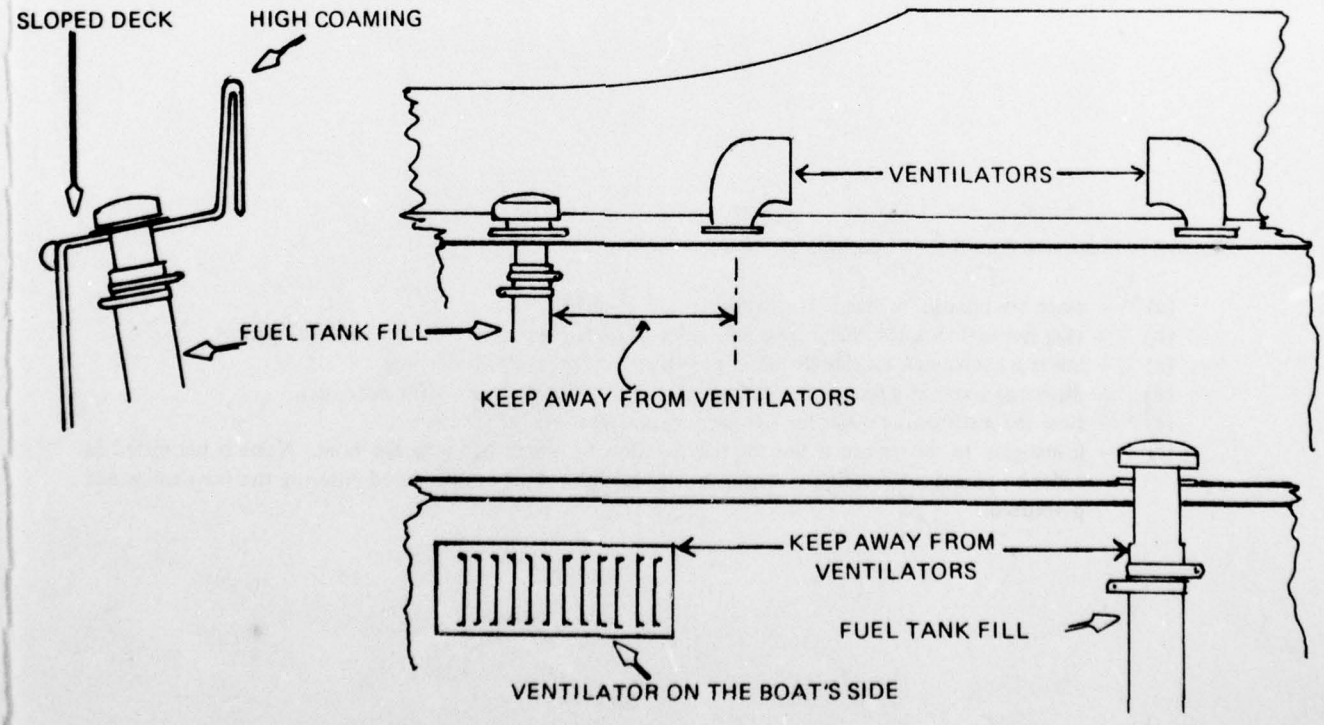
(a) Nearby ventilators, on deck or on the side of a boat could provide access for fuel to flow inside a boat. The distance between fuel fill opening and ventilators may have to be increased over that normally considered adequate for keeping vapors from entering ventilators.

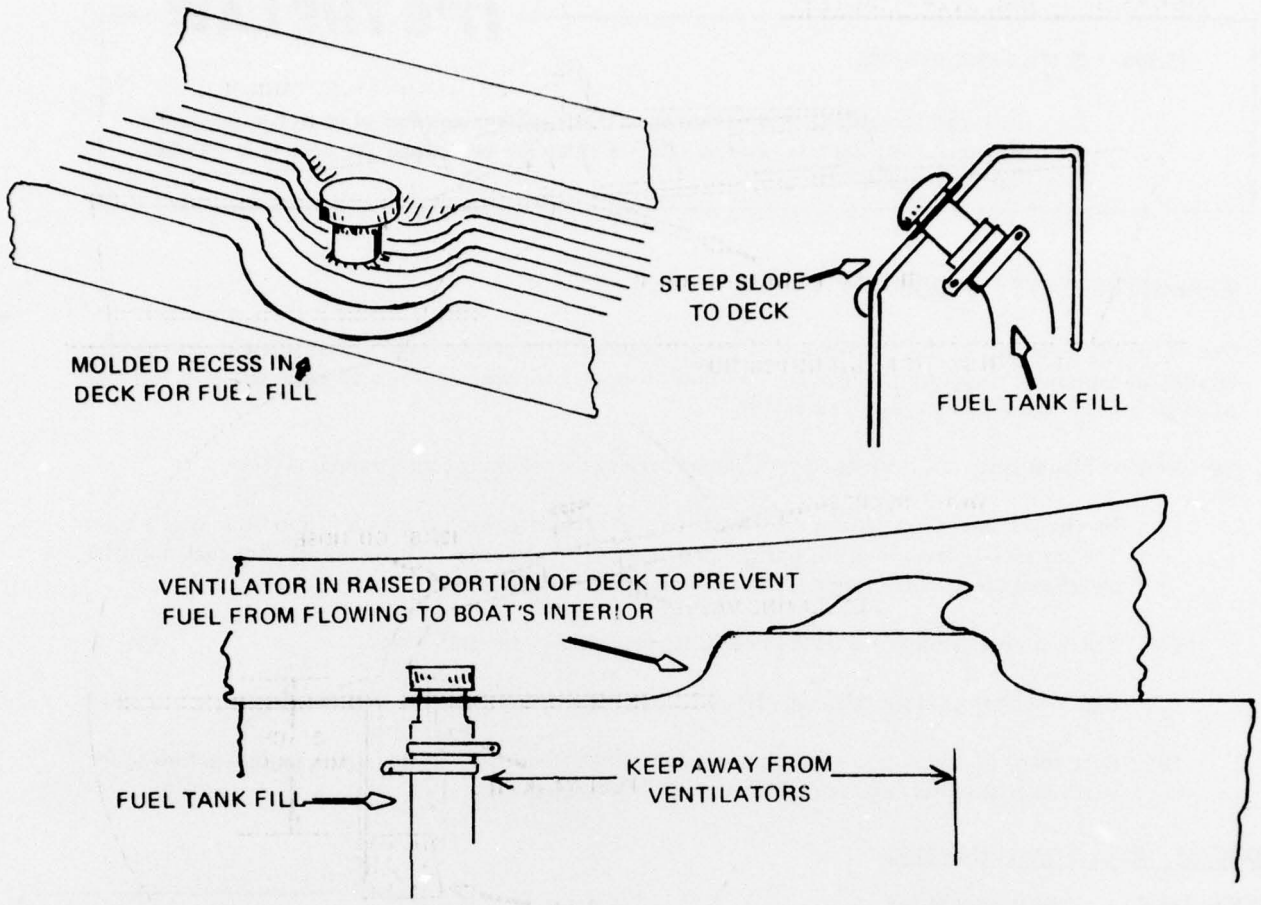
(b) The deck configuration and its slope could channel overflow fuel into a boat.

(c) High coamings or cabin sides can offer protection against overflow fuel from flowing inside of a boat.

(d) Deck joints in riveted construction or wooden construction could provide a path for fuel to flow to the boat's interior unless they are caulked to resist such fuel leakage.

FIGURE 33 - FUEL FILL LOCATIONS

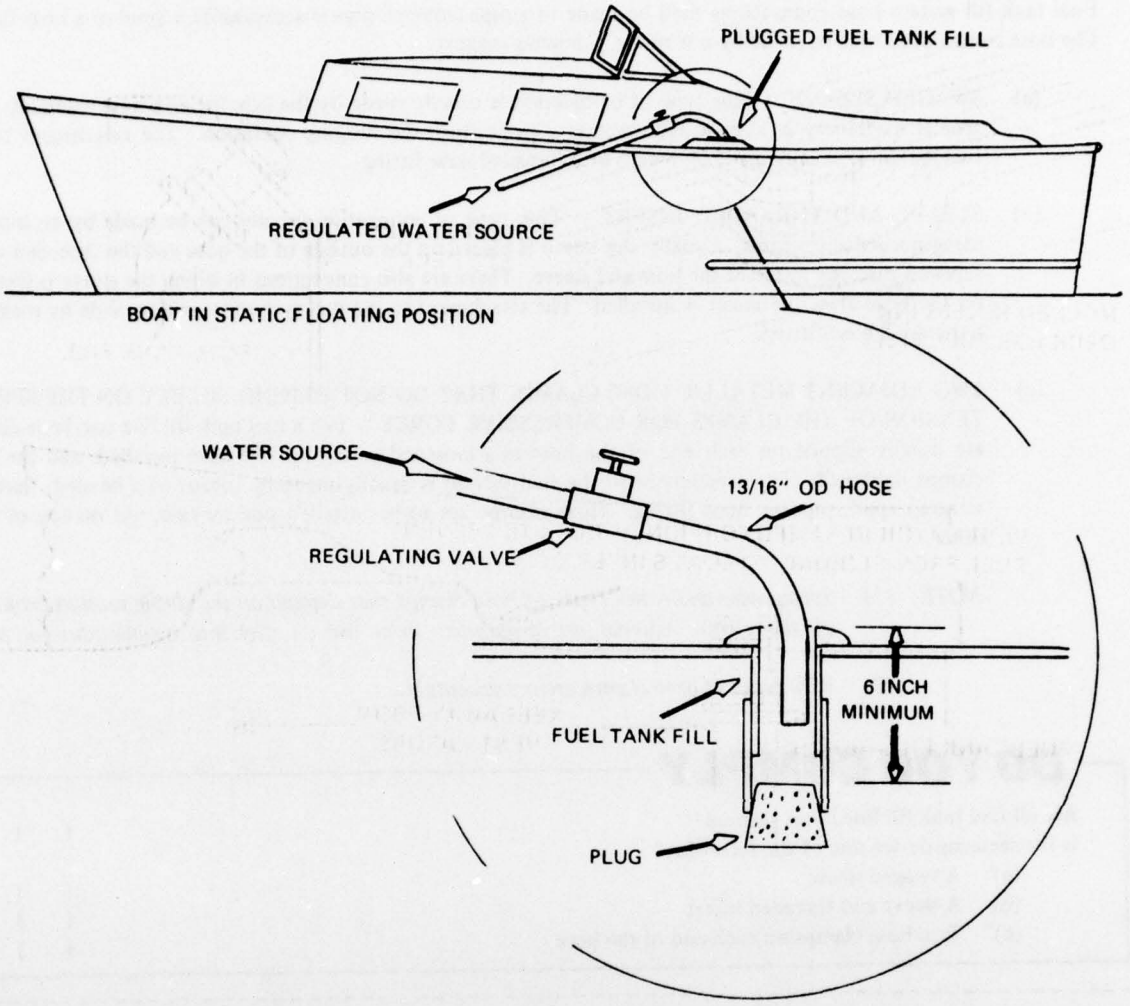




The test to determine compliance is as follows:

(a) – place the boat in its "static floating position" (See 183.505)
(b) – plug the fuel tank fill line at least a distance of six inches below the fuel tank fill opening.
(c) – insert a 13/16 inch outside diameter hose into the fuel tank fill opening.
(d) – discharge water at a rate of five gallons per minute (53.3 ounces in five seconds).
(e) – time the overflowing water for five seconds and shut off the flow.
(f) – investigate to determine if any of the overflowing water got into the boat. None is permitted in order to comply. Overflow entering a self-bailing cockpit is considered entering the boat and is not permitted.

FIGURE 34 - FUEL OVERFLOW TEST



DO YOU COMPLY

Gasoline will not overflow into the boat when the fuel fill is tested at an overflow rate of five gallons per minute for a period of five seconds with the boat in its "static floating position". ( )

IT'S THE LAW

183.564 FUEL TANK FILL SYSTEM

(b) Each hose in the tank fill system must be secured to a pipe, spud, or hose fitting by –

(1) a swaged sleeve;

(2) a sleeve and threaded insert; or

(3) two adjacent metallic hose clamps that do not depend solely on the spring tension of the clamps for compressive force.

EFFECTIVE DATE: FEBRUARY 1, 1978

Fuel tank fill system hose connections shall be made to a pipe (smooth pipe is acceptable), a spud or a hose fitting. The hose connections may be made by one of the following means:

(a) SWAGED SLEEVE – This type of connection is usually made by the supplier of a hose assembly since special machinery or apparatus is necessary to perform the swaging operation. The attachment to the fuel system is usually made by means of a threaded hose fitting.

(b) SLEEVE AND THREADED INSERT – This type of connection usually can be made by an installer using normal shop tools. Usually the sleeve is placed on the outside of the hose and the threaded insert screwed into the inside of the hose and sleeve. There are also connections in which the sleeve is installed on the hose after the insert is installed. The attachment to the fuel system is usually made by means of a threaded hose fitting.

(c) TWO ADJACENT METALLIC HOSE CLAMPS THAT DO NOT DEPEND SOLELY ON THE SPRING TENSION OF THE CLAMPS FOR COMPRESSIVE FORCE – For a fuel tank fill line two hose clamps are usually slipped on each end of the hose in a loosened condition, the hose installed, and the hose clamps tightened. The attachment to the fuel system is usually made by means of a beaded, flared or serrated spud, pipe or hose fitting. Hose clamps are to be installed side by side, not on top of each other.

NOTE: (1) Spring wire and other types of hose clamps that depend on the spring tension properties of the clamp material are prohibited from use on fuel line installations on boats.

(2) Wire types of hose clamps are not acceptable.

DO YOU COMPLY

Are all fuel tank fill line hoses secured? ( )
Is the securing device one of the following?
(a) A swaged sleeve ( )
(b) A sleeve and threaded insert ( )
(c) Two hose clamps on each end of the hose ( )

IT'S THE LAW

183.564 FUEL TANK FILL SYSTEM

(c) Each hose clamp in the tank fill system must be used with a hose designed for clamps.

EFFECTIVE DATE: FEBRUARY 1, 1978

Hoses may or may not be designed to be clamped, particularly wire or wire mesh reinforced hose. The proof of whether a hose is satisfactory is that the hose connection not leak when subjected to the "Static Pressure Test For Fuel Systems" (183.582) as required by 183.542.

DO YOU COMPLY

Hose has been selected for use with hose clamps such that connections will not leak when subjected to the "Static Pressure Test For Fuel Systems" (183.582). ( )

IT'S THE LAW

183.564 FUEL TANK FILL SYSTEM

(d) Hose clamps used in the tank fill system must –

(1) have a minimum nominal band width of at least one-half inch; and

(2) be over the hose and the spud, pipe, or hose fitting and not less than one-half inch from the end of the hose.

EFFECTIVE DATE: FEBRUARY 1, 1978

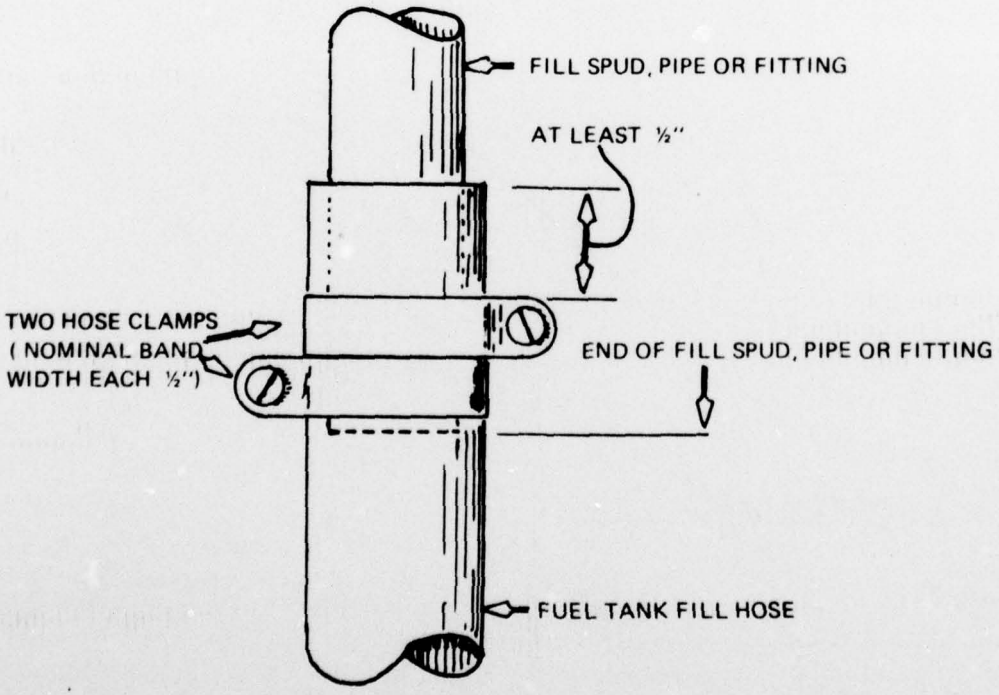
If hose clamps are used to secure a hose in the fuel tank fill system they must have a nominal band width of at least one-half inch. "Nominal" means that the normal SAE tolerances specified for hose clamps are acceptable. SAE states in their J536b standard for "Hose Clamps" that a one-half inch band width may actually measure 0.495 inches.

NOTE: Wire types of hose clamps are not acceptable.

Hose and hose clamps installations must be made so that the hose is pushed onto the spud, pipe (smooth pipe is permitted for fuel tank fill systems) or hose fitting far enough to permit two hose clamps to be fully over the spud, pipe or hose fitting and have at least one-half inch of the end of the hose protruding from the hose clamp closest to the end of the hose. Figure 35 depicts this installation.

NOTE: The inside diameter of a fuel tank fill hose may NOT be more than 0.065 inches larger than the minor outside diameter of the spud, pipe or hose fitting.

FIGURE 35 - FUEL TANK FILL HOSE CLAMPING



DO YOU COMPLY

Do the hose clamps used in the fuel tank fill system have at least a nominal band width of one-half inch? ( )

Are the two hose clamps fully over the spud, pipe or hose fittings? ( )

Is the hose clamp nearest the end of the hose at least one-half inch from the end of the hose? ( )

IT'S THE LAW

183.566 FUEL PUMPS: PLACEMENT

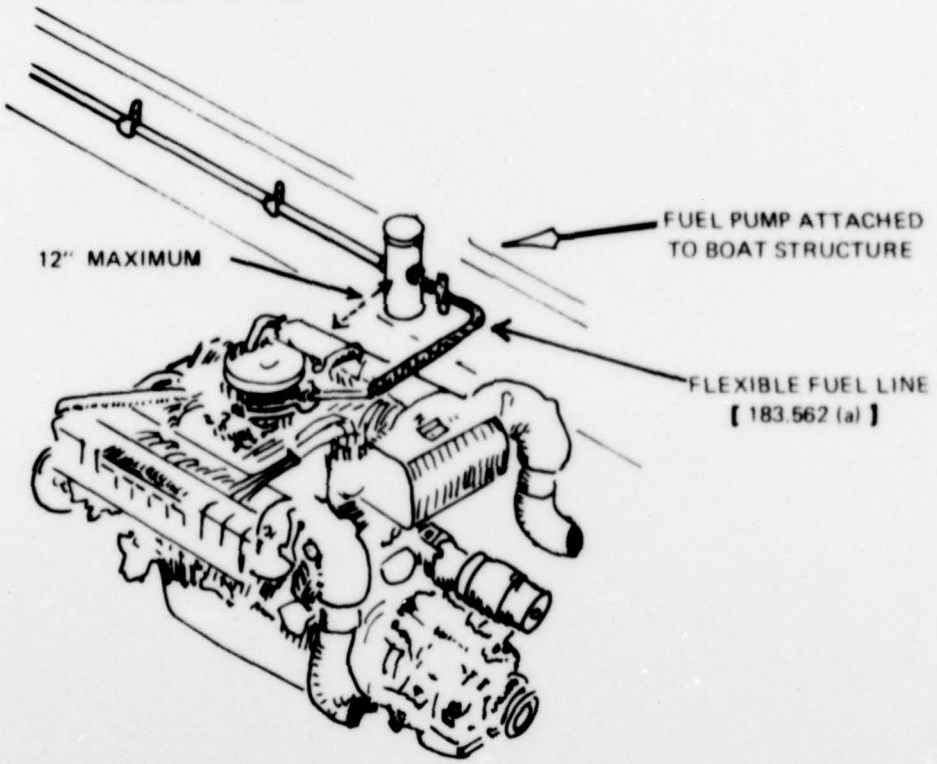
Each fuel pump must be on the engine it serves or within 12 inches of the engine, unless it is a fuel pump used to transfer fuel between tanks.

EFFECTIVE DATE: AUGUST 1, 1977

Most engines are equipped with a fuel pump as an installed component by the engine manufacturer. For those that are not so equipped a remote fuel pump (usually electric) may be used. In order to keep the length of the pressurized portion of the fuel distribution line at a minimum it is required that a remote fuel pump be installed within 12 inches of the engine. The 12 inches is measured directly to the engine not along the fuel line.

Pumps used to transfer fuel from one tank to another may be installed in other locations.

FIGURE 36 – REMOTE FUEL PUMP



DO YOU COMPLY

Is the fuel pump on the engine? ( )
If not, is the fuel pump within 12 inches of the engine? ( )
If not, is the fuel pump used only to transfer fuel from tank to tank? ( )

IT'S THE LAW

183.568 ANTI–SIPHON PROTECTION

Each fuel line from the fuel tank to the fuel inlet connection on the carburetor must –

(a) be above the level of the tank top; or

(b) have an anti-siphon device or an electrically operated fuel stop valve –

(i) At the tank withdrawal fitting; or

(ii) Installed so the line from the fuel tank is above the top of the tank.

EFFECTIVE DATE: AUGUST 1, 1977

"Anti-siphon protection" is a term applied to the means of preventing siphon action from permitting fuel to continue to flow out of the fuel tank in the event there is a break or rupture in a fuel distribution line or a fitting in the fuel distribution line loosens creating a leak.

"Anti-siphon protection" may be accomplished by ONE or more of the following methods:

(a) Keep all parts of the fuel line from the fuel tank to the fuel line connection at the carburetor above the level of the top of the fuel tank. The tank top level is determined with the boat in the "static floating position".

(b) Install an anti-siphon device at the tank withdrawal fitting. The fuel distribution line may then run below the level of the tank top. A filter may be installed between the fuel tank withdrawal fitting and the anti-siphon device.

NOTE: (1) Some anti-siphon devices are spring loaded check valves. These valves have a specific cracking pressure and provide protection up to a specific head. Therefore the anti-siphon valve must be selected or ordered to protect against the siphon head for a particular installation.

(2) Some anti-siphon devices involve a bleed hole within the fuel tank. The size of this hole is critical for a particular application. Each installation using this type of protection must be evaluated to assure its effectiveness. Too large a hole will bleed excessive air into the fuel flow affecting engine operation. Too small a hole may not stop fuel flow in the event of a fuel leak.

(3) Too high a cracking pressure may cause vapor-lock.

(c) Install an anti-siphon device at a location where a line from the fuel tank will no longer remain above the fuel tank top level. The anti-siphon device will then protect the portion of the line that must run below the tank top level and the portion of the line that is above the fuel tank top level will automatically take care of itself.

(d) Install an electrically operated fuel stop valve at the fuel tank withdrawal fitting. This valve requires electrical power to open and must be connected to operate only when the ignition switch is on. A filter may be installed between this valve and the fuel tank withdrawal fitting. Electrically operated fuel stop valves must comply with 183.528.

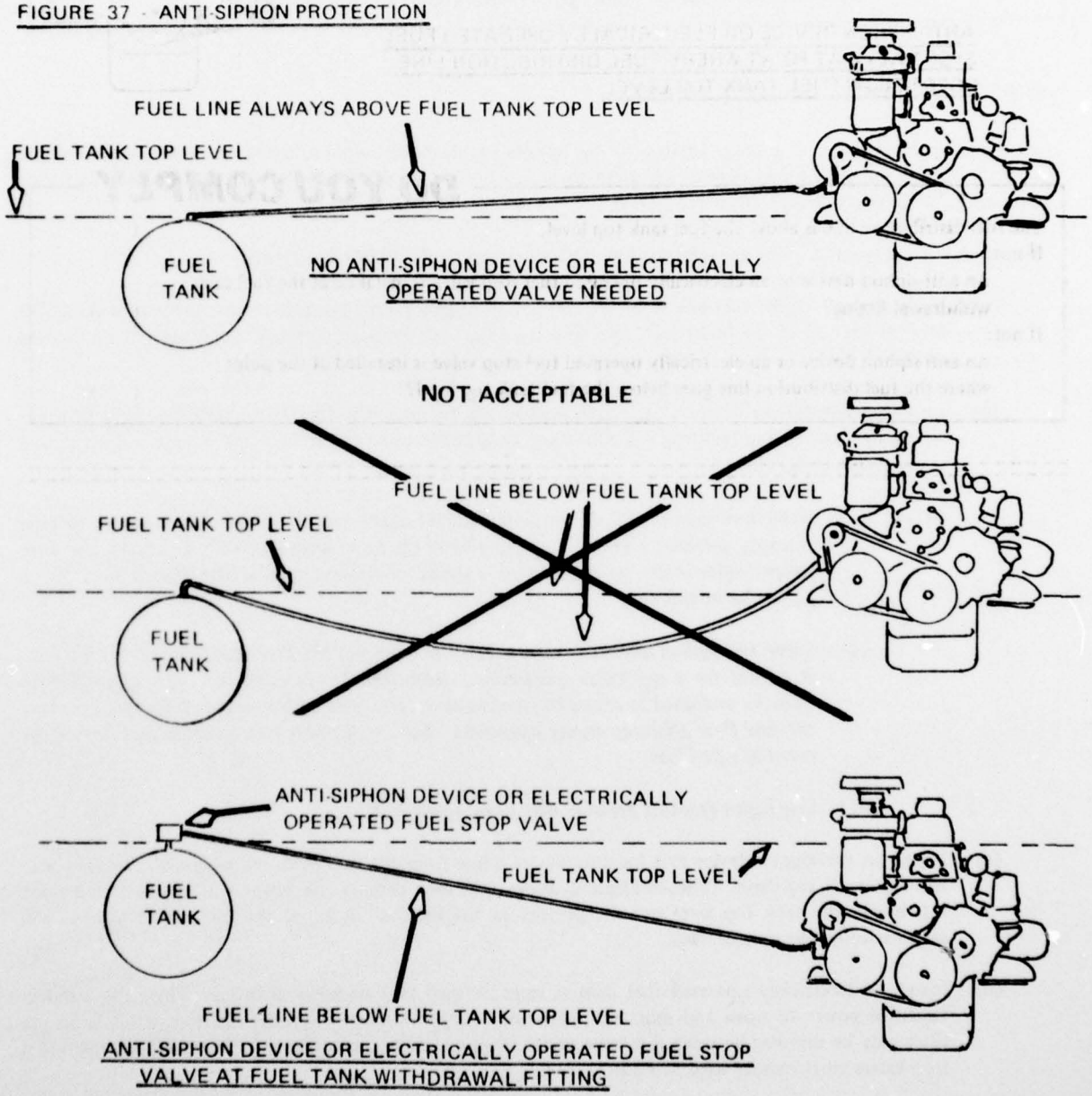
(e) Install an electrically operated fuel stop valve at the point in a fuel line when it must be run lower than the fuel tank top level.

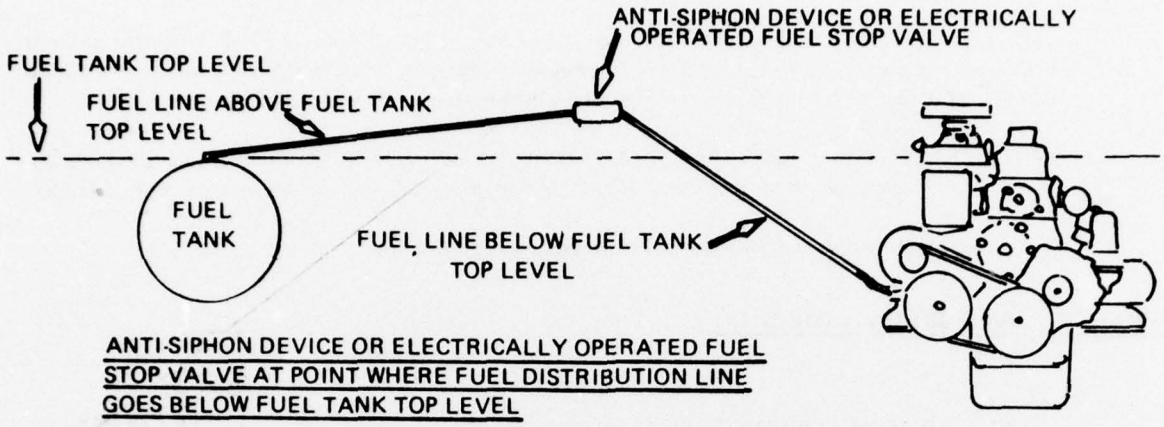
This valve requires electrical power to open and must be connected to operate only when the ignition switch, of the engine it serves, is on. A filter may be installed between this valve and the fuel tank withdrawal fitting. Electrically operated fuel stop valves must comply with 183.528.

NOTE: (1) Fuel stop valves used in the fuel system whether electrically operated or manually operated must withstand the 2 1/2 minute fire test in accordance with 183.590.

(2) Anti-siphon devices are not required to meet a fire test.

FIGURE 37 - ANTI-SIPHON PROTECTION





DO YOU COMPLY

The fuel distribution line is above the fuel tank top level. ( )

If not:

An anti-siphon device or an electrically operated fuel stop valve is installed at the fuel tank withdrawal fitting? ( )

If not:

An anti-siphon device or an electrically operated fuel stop valve is installed at the point where the fuel distribution line goes below the fuel tank top level? ( )

IT'S THE LAW

183.570 FUEL FILTERS AND STRAINERS: INSTALLATION

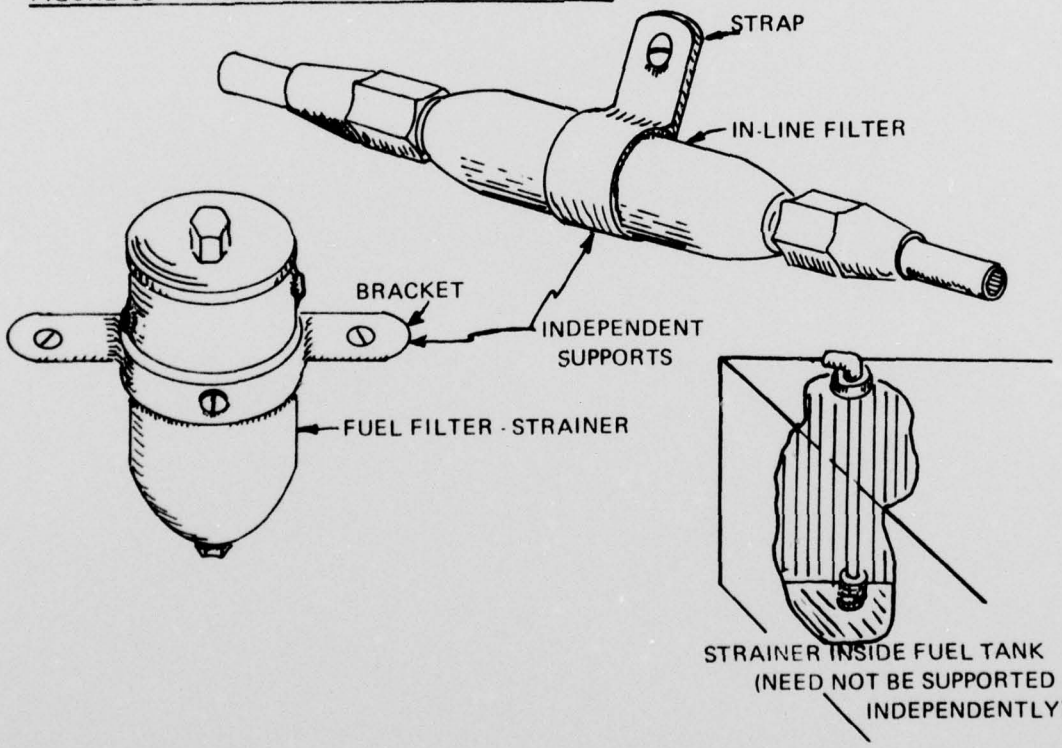
Each fuel filter and strainer must be supported on the engine or boat structure independent from its fuel line connections, unless the fuel filter or strainer is inside a fuel tank.

EFFECTIVE DATE: FEBRUARY 1, 1978

Fuel filters and strainers may not use the attached fuel lines for their primary means of support. Many fuel filters and strainers have brackets designed to provide support. If brackets are not provided as part of the fuel filter or strainer; clips, straps or other means must be employed to support the fuel filter or strainer independent of its connected fuel lines.

Fuel filters or strainers used inside of a fuel tank, such as might be attached to the fuel tank withdrawal fitting need not be independently supported.

FIGURE 38 - FUEL FILTER OR STRAINER SUPPORT



DO YOU COMPLY

All fuel filters and strainers not installed in a fuel tank are provided with support independent of the connected fuel lines. ( )

IT'S THE LAW

183.572 GROUNDING

Each metallic component of the fuel fill system and fuel tank which is in contact with fuel must be statically grounded so that the resistance between the ground and each metallic component of the fuel fill system and fuel tank is less than 100 ohms.

EFFECTIVE DATE: AUGUST 1, 1977

Fuel flowing from the dispensing nozzle into a fuel tank may be a potential source of a static electric charge which could cause a spark between the dispensing nozzle and metal components of the fuel tank fill system. To prevent such a spark from occurring it is required to ground the metallic components of the fuel tank fill system and a metallic fuel tank.

Grounding (or bonding) may be accomplished by connecting the metallic components electrically by running a wire from one component to the next, and so forth to the boats ground. Grounding can usually be accomplished by a connection to the common bonding conductor or to the engine negative terminal.

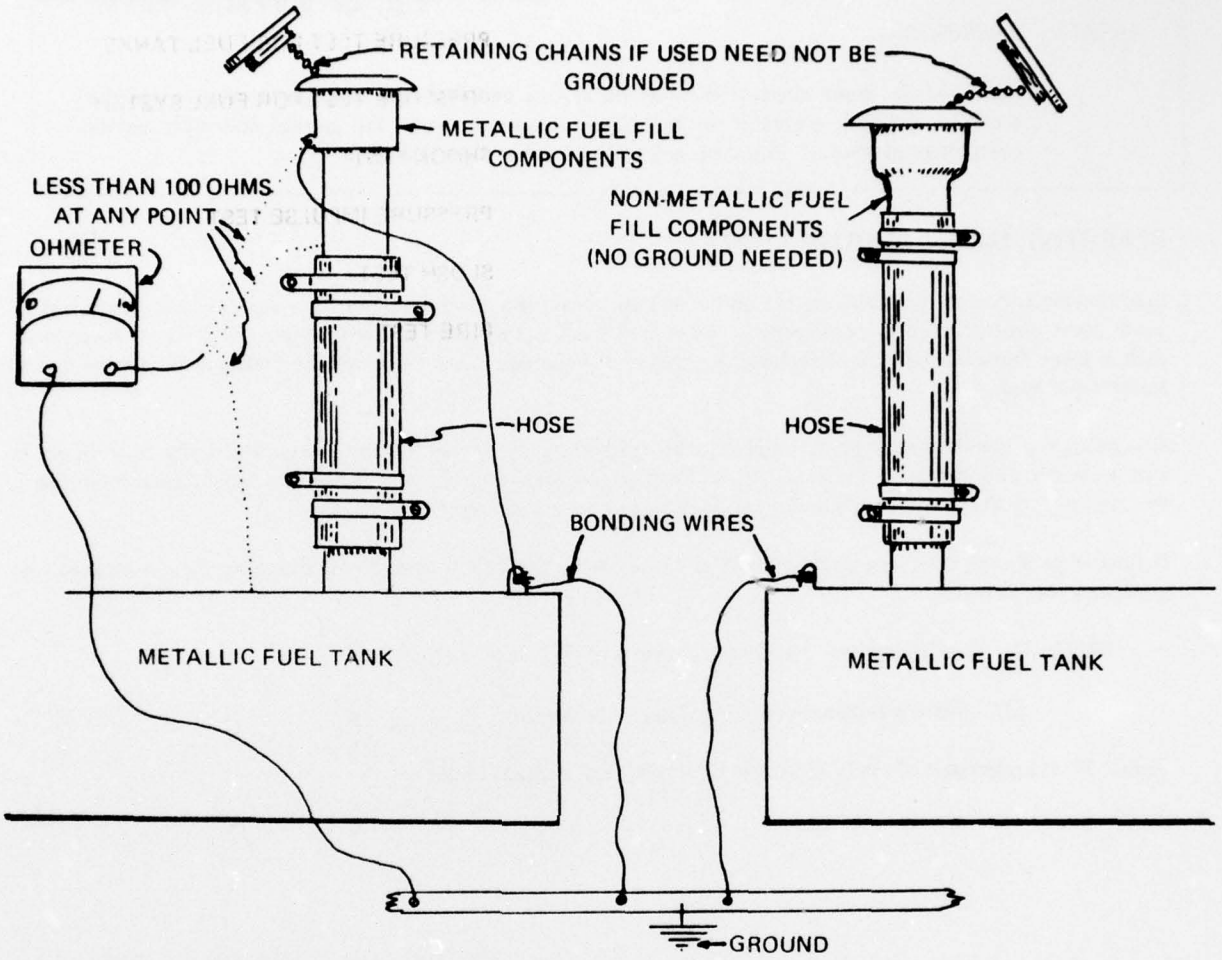
If the fuel tank deck fill fitting is non-metallic and non-conductive hose is used as a fill pipe then there is no need for grounding the fill fitting.

NOTE: (1) If a metal hose attachment fitting is used it must be grounded.

(2) Fill cap retaining chains need not be grounded.

Figure 39 is a schematic of Fuel Fill System Grounding and a means of test.

FIGURE 39 - FUEL FILL SYSTEM GROUNDING



CAUTION : BONDING WIRES PUT UNDER A HOSE CLAMP USED TO SECURE A HOSE COULD CAUSE A FUEL LEAK.

DO YOU COMPLY

Are metallic components of the fuel tank fill system and the metallic fuel tank GROUNDED? ( )

Is the resistance between each of these metallic components including the metallic fuel tank, and ground less than 100 ohms? ( )

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TESTS

PRESSURE TEST FOR FUEL TANKS

PRESSURE TEST FOR FUEL SYSTEM

SHOCK TEST

PRESSURE IMPULSE TEST

SLOSH TEST

FIRE TEST

CAUTION

The following test procedures are not intended to provide sufficient details to properly conduct the required tests. The information provided is to familiarize the user of this guideline with the objectives of the tests and to diagram in schematic form some of the test considerations.

For full details refer to "United States Coast Guard Compliance Test Procedures-Fuel System Standards". Copies of this standard are available from:

National Technical Information Service
Springfield, VA 22151

IT'S THE LAW

183.580 STATIC PRESSURE TEST FOR FUEL TANKS

A fuel tank is tested by performing the following procedures in the following order:

(a) Fill the tank with air or inert gas to the pressure marked on the tank label under 183.514(b)(5). The pressure is measured by a calibrated pressure gauge with a pressure range not exceeding three times the test pressure required by this paragraph or by a manometer.

EFFECTIVE DATE: AUGUST 1, 1977

In most installations it is almost impossible to inspect completely all surfaces of a tank. Therefore, this test should be performed before the tank is installed. Testing the tank before installation should result in the discovery of defects in the tank that could result in drastic disassembly of the boat if such test was performed after installation.

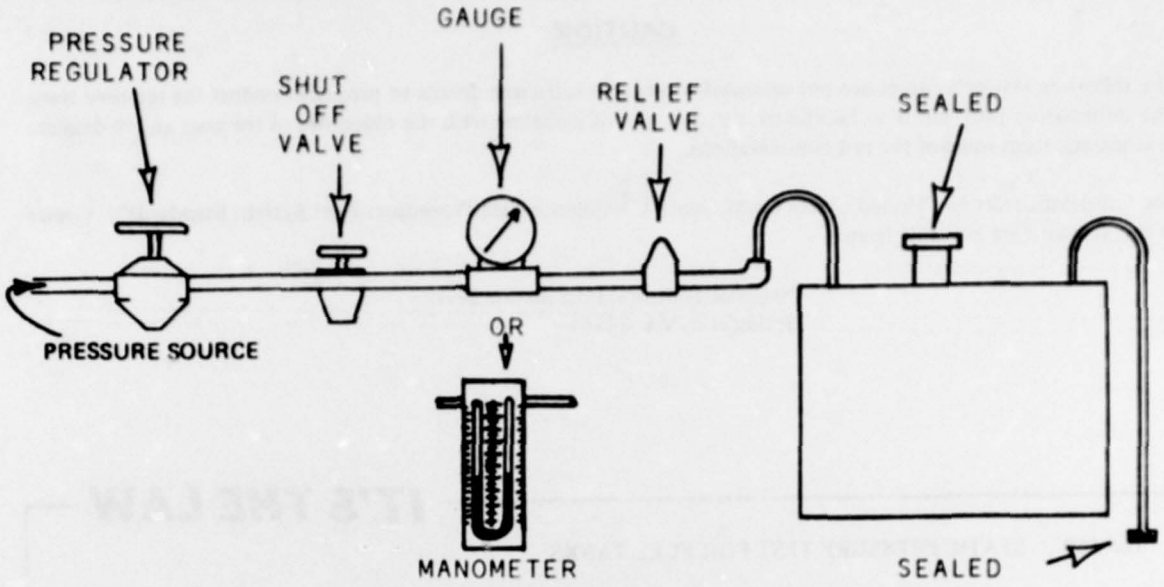
The tank should be empty for this test. Testing pressure can be supplied by pressurized air or compressed inert gas. The tank's rated testing pressure is marked on the tank, but in no case will it be below 3 psig.

During the test the sides, top and bottom of the tank should be accessible. All openings except the one used to admit the pressure should be sealed.

A regulated source of pressure, a gauge or manometer, a "pop-off" or relief valve and a shut off valve will be needed. The gauge should have a range of less than three times the test pressure. The relief valve should be set for less than the maximum gauge pressure to prevent harm to the gauge and as a safety measure for testing personnel.

Figure 40 is a schematic of a typical Fuel Tank Pressure Test set up.

FIGURE 40 - TYPICAL FUEL TANK PRESSURE TEST



When the tank has been pressurized to its rating it should be isolated from the pressure source by closing the shut-off valve.

IT'S THE LAW

183.580 STATIC PRESSURE TEST FOR FUEL TANKS

(b) Examine each tank fitting and seam for leaks using a leak detection method other than the pressure drop method.

EFFECTIVE DATE: AUGUST 1, 1977

The static pressure test must be supplemented with another method to check for leaks.

Soapy water or a detergent solution, both of which should be non-corrosive and non-toxic can be used, as can total immersion of the tank in water. Most small leaks do not produce an immediately detectable drop on the face of the pressure gauge, but soap solutions or immersion will reveal very small leaks by bubbling.

CAUTION: ***It is suggested that soapy test solutions be non-corrosive and non-toxic.*** **Ammonia, which is present in some soaps and detergents create a condition which attacks brass fittings like those used in fuel systems. Undetectable at first, in a matter of months these fittings may develop cracks creating a very hazardous situation.**

If immersion of the tank is used, remember that immersion increases the pressure on the outside of the tank above normal atmospheric pressure. The testing pressure in this case must be the differential in actual pressures. For example, if the "head" of water over a tank will produce 1 pound of pressure and the tank is to be tested to a label pressure of 3 pound per square inch then the underwater inside the tank pressure must be 4 pounds per square inch. For every foot of "head" the pressure correction is 0.433 psig.

There are also several devices available that are designed to detect small leaks of the nature of those that might appear in fuel systems. Most work on a principle of amplification of sound or detection of sounds of certain frequencies.

Inspect all seams and the attachments; fill, vent, fuel lines, fuel level indicator, etc. for leakage.

CAUTION

The following test procedures are not intended to provide sufficient details to properly conduct the required tests. The information provided is to familiarize the user of this guideline with the objectives of the tests and to diagram in schematic form some of the test considerations.

For full details refer to "United States Coast Guard Compliance Test Procedures-Fuel System Standards". Copies of this standard are available from:

National Technical Information Service
Springfield, VA 22151

IT'S THE LAW

183.582 STATIC PRESSURE TEST FOR FUEL SYSTEMS

A fuel system is tested by performing the following procedures in the following order:

(a) Fill the portion of the system that is between the fuel line connection at the engine fuel inlet and the fill and vent fitting on the boat, with air or inert gas to the greater of the following pressures:

(1) Three PSIG.

(2) One and one-half times the pressure created at the lowest point in the fuel system when the fill or vent line, whichever is lower in height, is filled to its top with fuel.

EFFECTIVE DATE: AUGUST 1, 1977

What pressure do you use for testing fuel systems?

EITHER: (1) 3 pounds per square inch gauge, or;

(2) 1.5 times the pressure head at lowest point of the system whichever is greater. Figure 42 shows the test pressure for a measured height of fuel system.

Using pressurized air or inert gas, pressurize the fuel system to the pressure determined above.

It is recommended that a pressure relief valve be installed in the pressurizing system for safety. Set it to a maximum of 50 percent higher than the required test pressure.

A shut-off valve should be in the pressurizing system so that upon reaching the specified pressure the fuel system may be isolated from the pressurizing system.

FIGURE 41 - TEST PRESSURE DETERMINATION

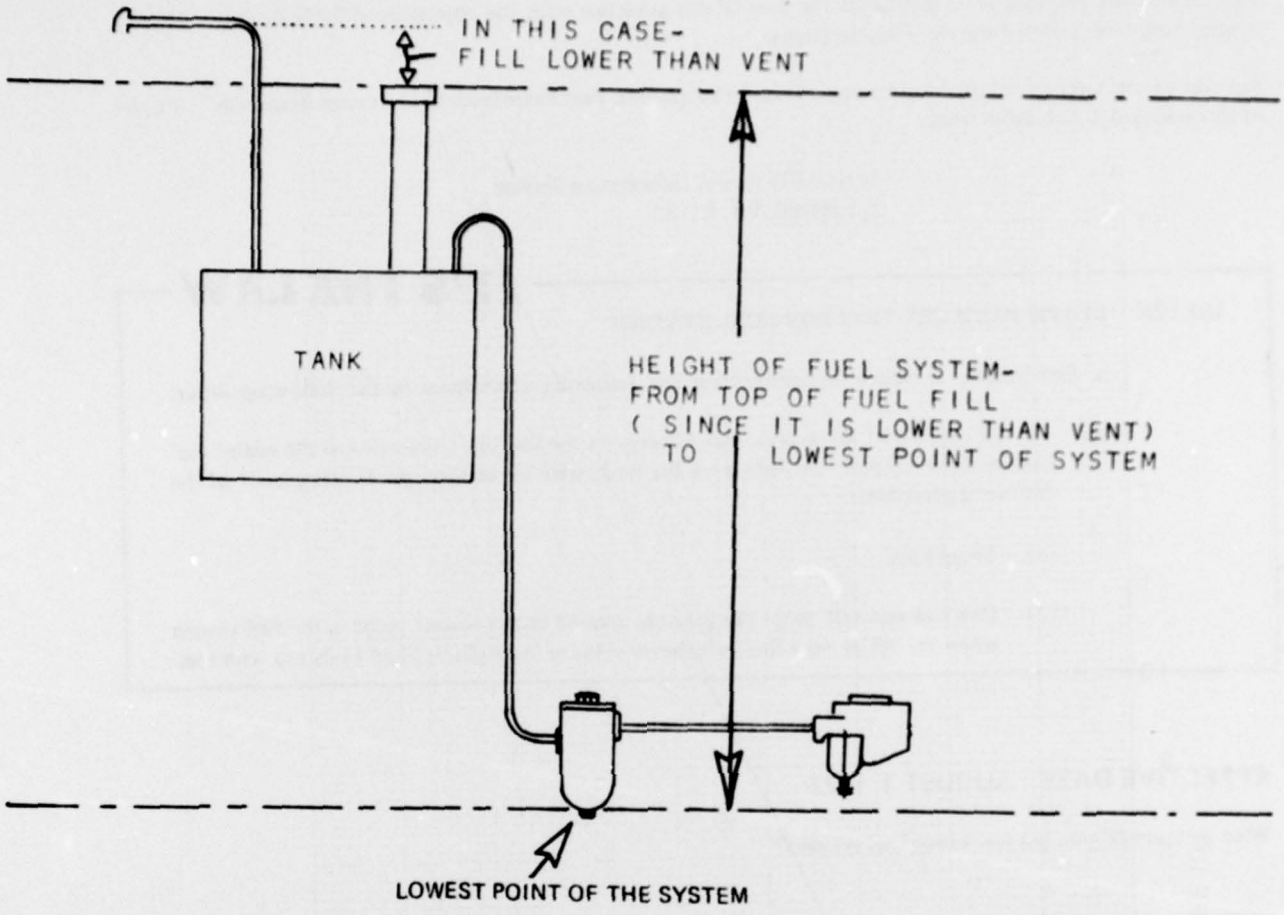


FIGURE 42 - FUEL SYSTEM TEST PRESSURE

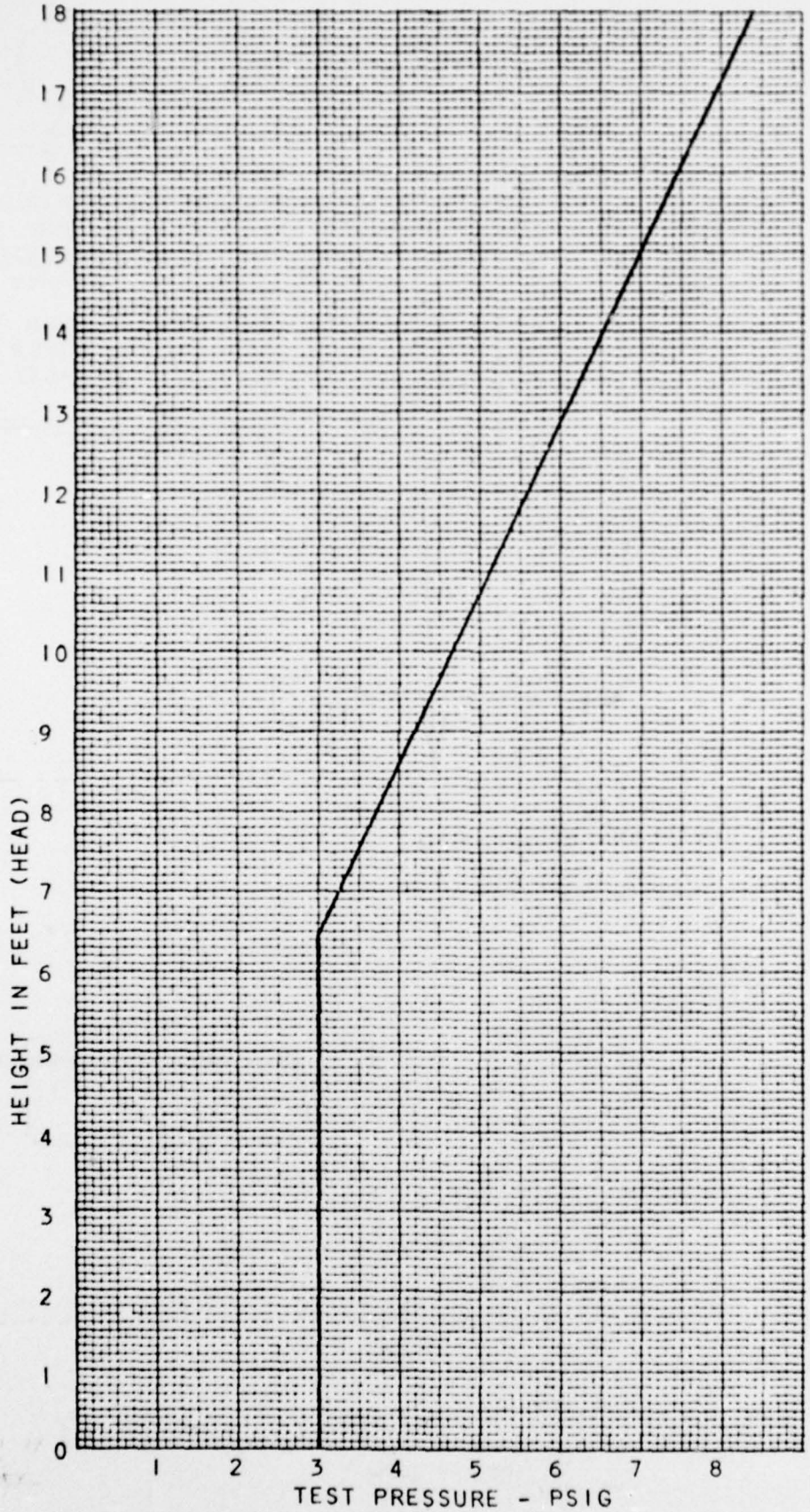
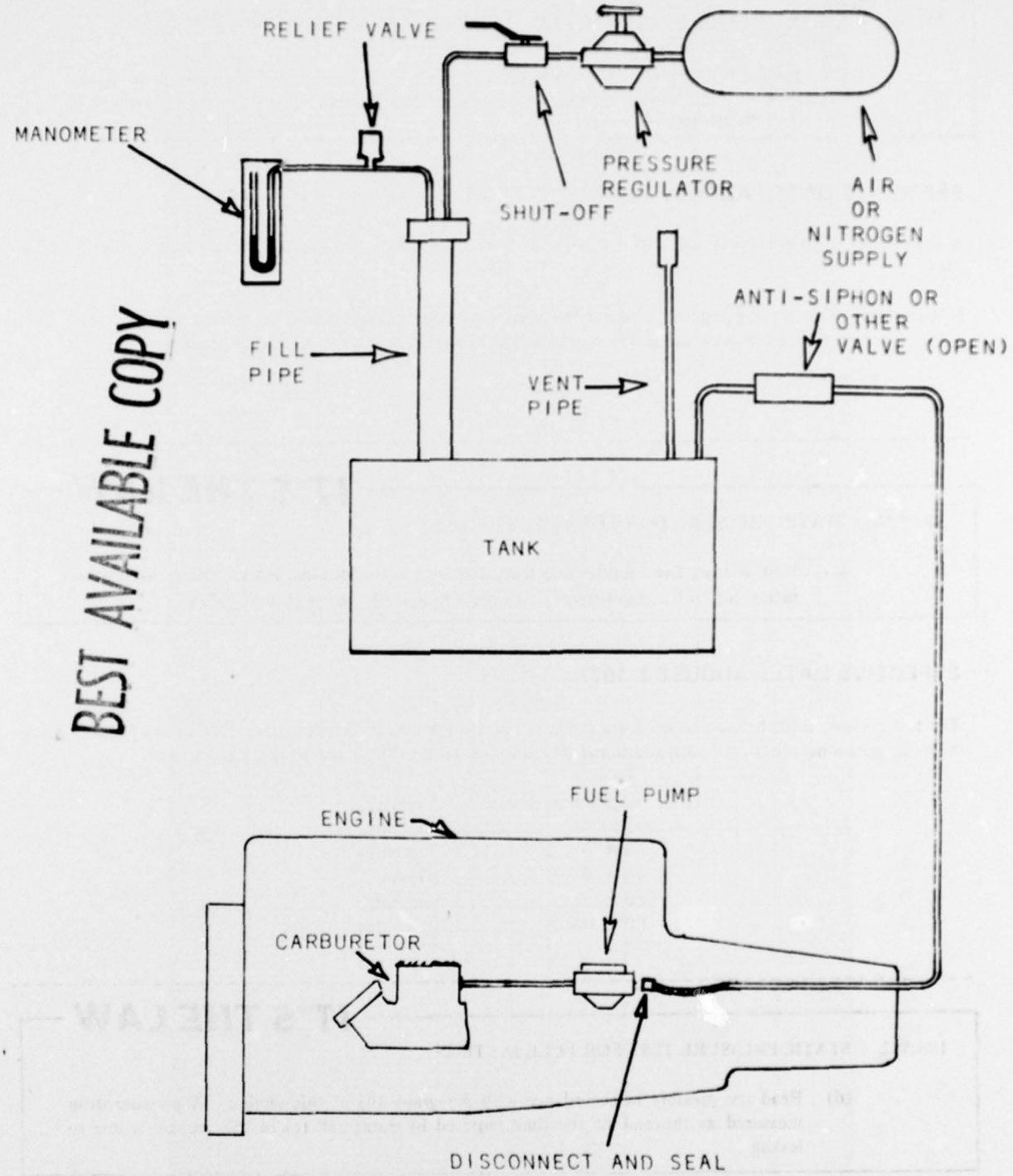


FIGURE 43 - FUEL SYSTEM PRESSURE TEST



IT'S THE LAW

183.582 STATIC PRESSURE TEST FOR FUEL SYSTEMS

(b) Read the pressure. The pressure is measured by a calibrated pressure gauge with a pressure range not exceeding three times the test pressure required by this paragraph or by a manometer.

EFFECTIVE DATE: AUGUST 1, 1977

A manometer, or a pressure gauge with a range that does not exceed three times the required pressure should be used.

It is important that the temperature of the entire system be stabilized just before and during the entire test. A rise or drop in the temperature anywhere in the system will most likely cause a rise or drop in pressure.

IT'S THE LAW

183.582 STATIC PRESSURE TEST FOR FUEL SYSTEMS

(c) Wait at least five minutes and thereafter wait one additional minute for each 10 gallon increment, or fraction thereof, in the tank's capacity greater than 50 gallons.

EFFECTIVE DATE: AUGUST 1, 1977

The test pressure must be maintained for a minimum of five minutes for a fuel system of 50 or less gallons capacity with one additional minute for each additional 10 gallons or fraction above the 50 gallons.

50 gallons or less	5 minutes
50 to 60	6 minutes
60 to 70	7 minutes
70 to 80	8 minutes
80 to 90	9 minutes
90 to 100	10 minutes
Etc.	

IT'S THE LAW

183.582 STATIC PRESSURE TEST FOR FUEL SYSTEMS

(d) Read the pressure in accordance with paragraph (b) of this section. A pressure drop measured at the end of the time required by paragraph (c) of this section is due to leakage.

EFFECTIVE DATE: AUGUST 1, 1977

Here pressure drop can be used as an indication of a leaking fuel system. If a pressure drop is shown at the end of the time period, the fuel system leaks and does not pass the test.

IT'S THE LAW

183.582 STATIC PRESSURE TEST FOR FUEL SYSTEMS

(e) If no pressure drop is measured by the manometer or pressure gauge, then while the system remains pressurized, examine each fuel fitting, joint, and connection except each connection at fill and vent fittings for leaks, using a leak detection method other than the pressure drop method.

EFFECTIVE DATE: AUGUST 1, 1977

At the end of a static pressure test time period, when no drop is evidenced, test all the connections, fittings, joints, etc., for leakage by a method other than pressure drop.

To determine where the fuel system leaks use a non-corrosive, non-toxic soapy water or detergent solution applied to the connections, fittings, joints, valves, depth indicators, etc. If a leak is detected and it can be corrected by re-torquing a fitting, correct the leak and repeat the test. If it can not be corrected by that method, replace the defective element of the fuel system.

CAUTION: It is suggested that soapy test solutions be non-corrosive and non-toxic. Ammonia, which is present in some soaps and detergents create a condition which attacks brass fittings like those used in fuel systems. Undetectable at first, in a matter of months these fittings may develop cracks creating a very hazardous situation.

There are also several devices available that are designed to detect small leaks of the nature of those that might appear in fuel systems. Most work on a principle of amplification of sound or detection of sounds of certain frequencies.

Boat mounted fuel fill and vent connections are exempted from the additional leak detection test.

Fuel fill and vent connections on the fuel tank must be checked.

CAUTION

The following test procedures are not intended to provide sufficient details to properly conduct the required tests. The information provided is to familiarize the user of this guideline with the objectives of the tests and to diagram in schematic form some of the test considerations.

For full details refer to "United States Coast Guard Compliance Test Procedures-Fuel System Standards". Copies of this standard are available from:

National Technical Information Service
Springfield, VA 22151

IT'S THE LAW

183.584 SHOCK TEST

A fuel tank is tested by performing the following procedures in the following order:

(a) Perform the static pressure test under 183.580.

EFFECTIVE DATE: AUGUST 1, 1977

To prepare the fuel tank for the shock test a pressure test must be conducted first. (See 183.580)

The fuel tank must be pressurized with air or inert gas to the pressure stated on the label, and while pressurized inspected for leaks using the soapy water or total immersion test. If bubbles reveal leaks, the fuel tank fails this test, don't proceed any further.

This test is construed to be a destructive test and a fuel tank subjected to this test should not be installed in a boat.

IT'S THE LAW

183.584 SHOCK TEST

(b) If the tank is non-metallic, fill it to capacity with a gasoline that has at least a 50 percent aromatic content. Keep the fuel in the tank at 21°C or higher for 30 days prior to testing.

EFFECTIVE DATE: AUGUST 1, 1977

If the fuel tank passes the pressure test, and it is non-metallic, it must then be filled with a gasoline that has at least a 50 percent aromatic content.

What this refers to is the same type of test fuel specified as ASTM Reference Fuel C. The average "Premium" gasoline bought at a roadside filling station does not quite reach 50 percent aromatics, it being on the average of 45 percent aromatics. One company does sell this type of fuel in certain locations; The Phillips Company.

ASTM Reference Fuel C is compounded to produce the severe swelling (or shrinking) and degrading actions of "Premium" gasoline. It consists of 50 percent Toluene and 50 percent Issooctane.

The non-metallic fuel tank must be kept filled with this test fuel for 30 days at ambient temperature (but no less than 70°F (21°C)), and ambient pressure without being adversely affected.

This is a pre-conditioning for further testing.

IT'S THE LAW

183.584 SHOCK TEST

(c) Mount the tank to the platform of an impact test machine.

EFFECTIVE DATE: AUGUST 1, 1977

Generally, the mounting of the fuel tank to be tested should simulate the actual installation conditions to be found aboard a boat.

The fuel tank will be subjected to 1000 shock cycles using a suitable shock machine. Few boat manufacturers have the test equipment to conduct these tests, so they are usually done by the fuel tank manufacturer, testing lab or other facilities.

A flat bottomed fuel tank may be mounted directly on the test platform; a fuel tank with something other than a flat bottom must be mounted in fitting chocks, and it's best to use the type of chocks that will be used in actual construction of the boat, chocks that exactly fit the contour of the fuel tank's bottom.

The fuel tank should include all attachments and fittings as would normally be found on a fuel tank, such as a fuel gauge, fuel feed adapter, etc.

IT'S THE LAW

183.584 SHOCK TEST

(d) Fill the tank to capacity with water.

EFFECTIVE DATE: AUGUST 1, 1977

Before conducting further testing, if the tank is a non-metallic type it has undergone the 30 day test with a 50 percent aromatic fuel, or if it is a tank that has previously contained fuel, it should have been flushed or purged of all traces of the fuel. This can be done with water or inert gas.

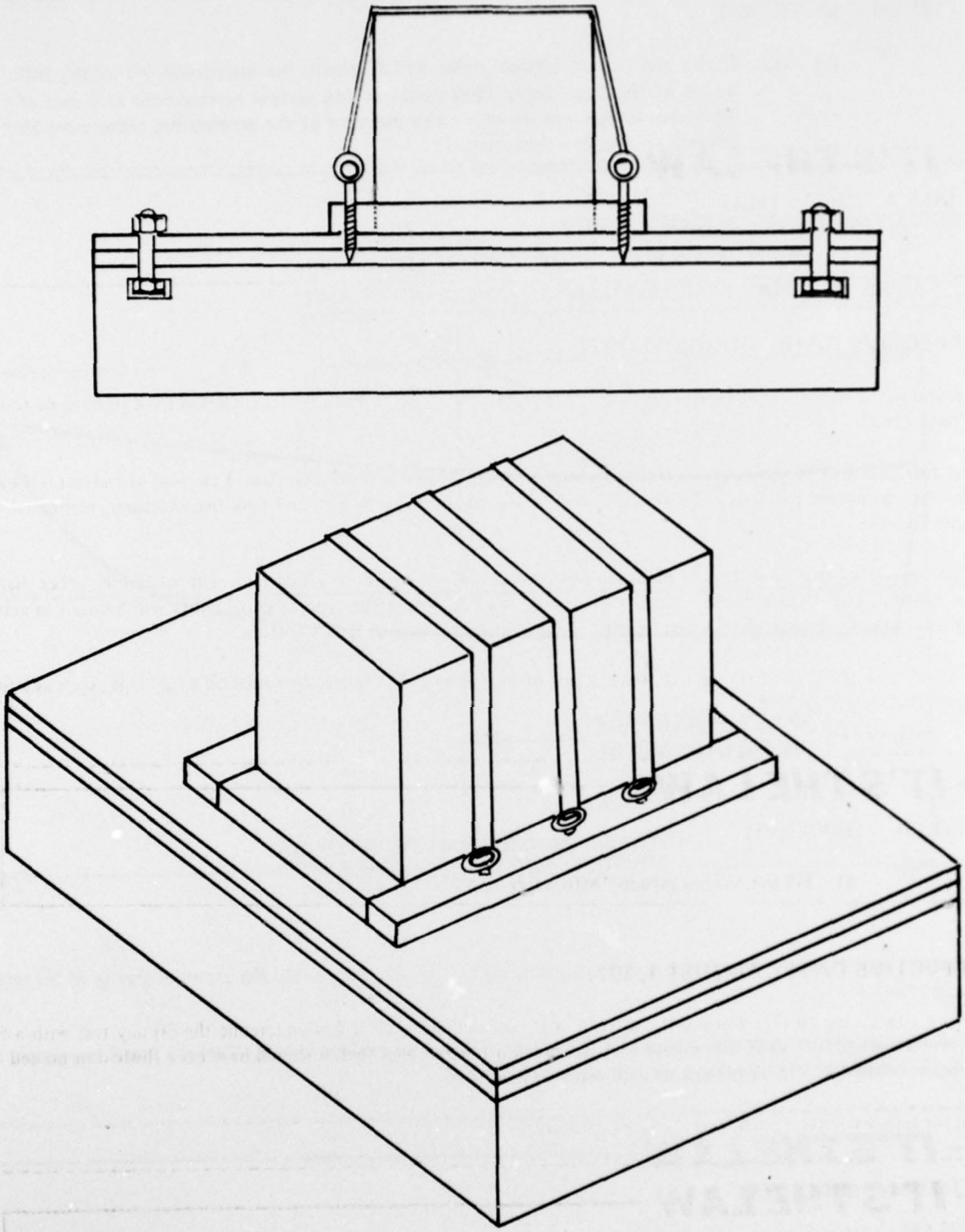
Fill the tank with water to at least the rated capacity.

IT'S THE LAW

183.584 SHOCK TEST

(e) Apply one of the following accelerations within three inches of the center of the horizontal mounting surface of the tank. The duration of each vertical acceleration pulse is measured at the base of the shock envelope.

FIGURE 44 - SHOCK TEST -- FUEL TANK MOUNTING



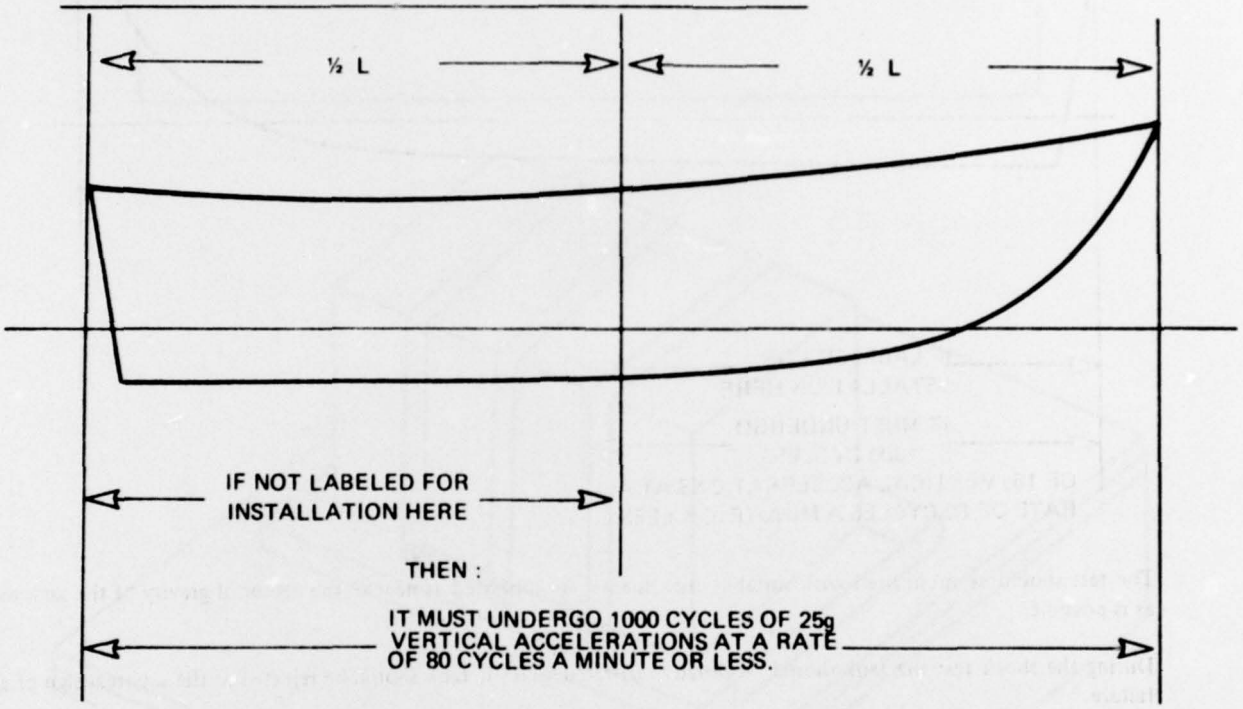
IT'S THE LAW

183.584 SHOCK TEST

(e) (1) If the tank is not labeled under 183.514(b)(8) for installation aft of the half length of the boat, apply 1000 cycles of 25g vertical accelerations at a rate of 80 cycles or less per minute. The duration of the acceleration pulse must be between six and 14 milliseconds.

EFFECTIVE DATE: AUGUST 1, 1977

FIGURE 45 -- FUEL TANK INSTALLED ANYWHERE IN THE BOAT



The test should be monitored with suitable instrumentation mounted as near to the center of gravity of the tank as is possible.

The tank should be inspected during the shock test to detect an obvious failure. This is a visual inspection, and should a failure of any type occur the tank should be rejected.

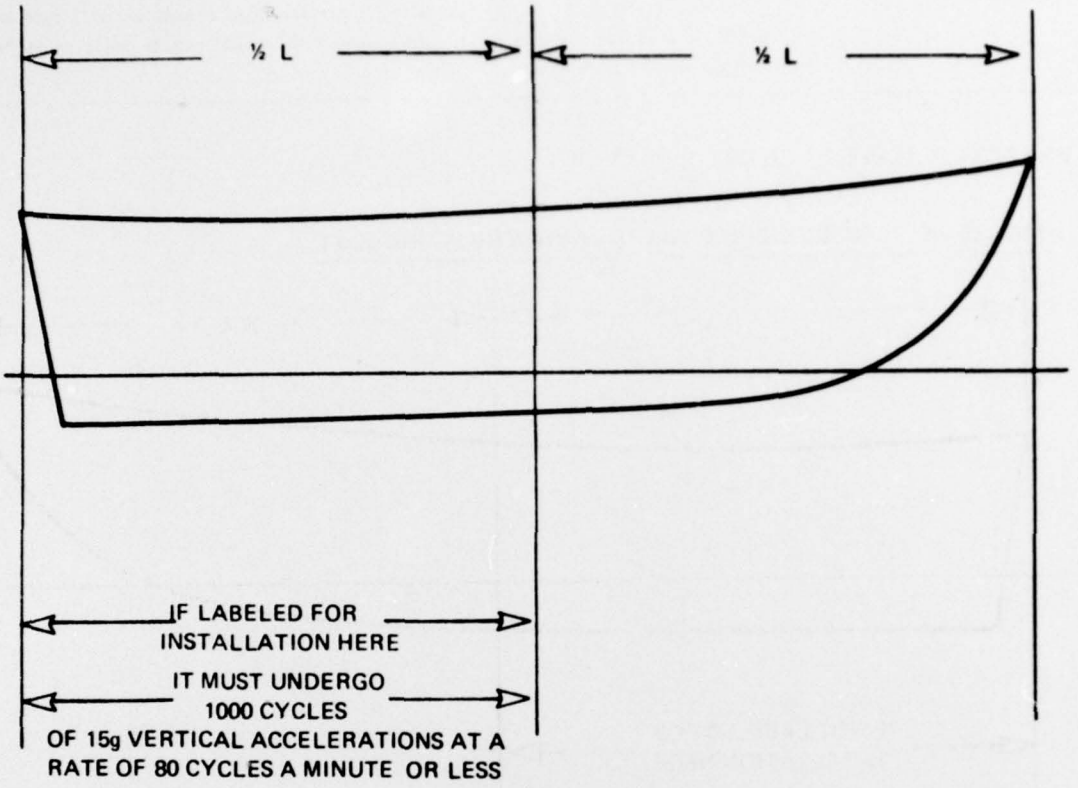
IT'S THE LAW

183.584 SHOCK TEST

(e) (2) If the tank is manufactured for installation with its center of gravity aft of the half length of the boat, apply 1000 cycles of 15g vertical accelerations at a rate of 80 cycles or less per minute. The duration of the shock pulse must be between six and 14 milliseconds.

EFFECTIVE DATE: AUGUST 1, 1977

FIGURE 46 - FUEL TANK INSTALLED AFT OF THE HALF LENGTH



The test should be monitored with suitable instrumentation mounted as near to the center of gravity of the tank as as is possible.

During the shock test the tank should be visually inspected, and the tank should be rejected at the slightest sign of a failure.

IT'S THE LAW

183.584 SHOCK TEST

(f) Perform the static pressure test under 183.580.

EFFECTIVE DATE: AUGUST 1, 1977

After performing the shock test a pressure test must be performed as a verification that the tank doesn't leak. If any leakage is found during the pressure test, the tank failed the test.

==========

CAUTION

The following test procedures are not intended to provide sufficient details to properly conduct the required tests. The information provided is to familiarize the user of this guideline with the objectives of the tests and to diagram in schematic form some of the test considerations.

For full details refer to "United States Coast Guard Compliance Test Procedures-Fuel System Standards". Copies of this standard are available from:

National Technical Information Service
Springfield, VA 22151

IT'S THE LAW

183.586 PRESSURE IMPULSE TEST

A fuel tank is tested by performing the following procedures in the following order:

(a) Perform the static pressure test under 183.580.

EFFECTIVE DATE: AUGUST 1, 1977

The pressure Impulse Test is applicable only to fuel tanks which have a rated capacity of 25 gallons or more. Tanks which have a rated capacity of 25 gallons (94.61 liters) or more up to 100 gallons (378.51 liters) must be subjected to the Pressure Impulse Test while tanks which have a rated capacity of 100 gallons or more must be subjected to both the Pressure Impulse Test and the Slosh Test.

Before subjecting the tank to the Pressure Impulse Test it should be subjected to the Static Pressure Test (183.580) and pass with no leakage.

The empty tank must be pressurized with air or compressed inert gas to the pressure indicated on the label.

This test is construed to be a destructive test and a fuel tank subjected to this test should not be installed in a boat.

IT'S THE LAW

183.586 PRESSURE IMPULSE TEST

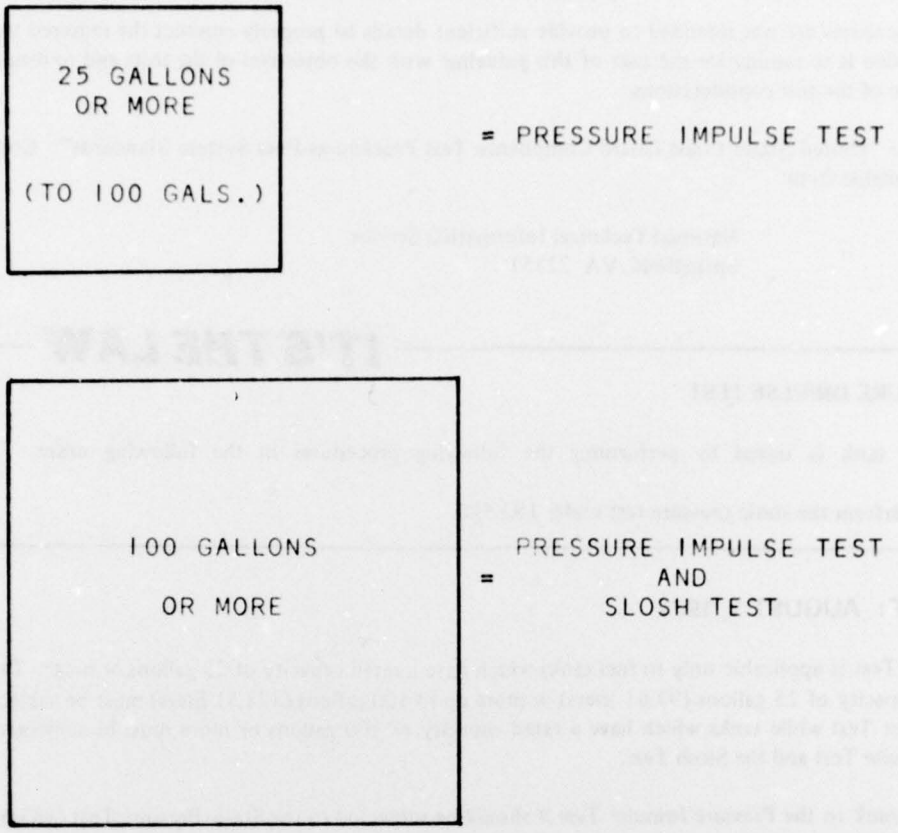
(b) If the tank is non-metallic, fill it to capacity with a gasoline that has at least a 50 percent aromatic content. Keep the fuel in the tank at 21°C or higher for 30 days prior to testing.

EFFECTIVE DATE: AUGUST 1, 1977

Non-metallic tanks should be filled to rated capacity with a gasoline such as ASTM Reference Fuel C for a period of 30 days at a temperature of not less than 70°F (21°C).

This is a pre-conditioning for further testing.

FIGURE 47 - PRESSURE IMPULSE TEST APPLICABILITY



IT'S THE LAW

183.586 PRESSURE IMPULSE TEST

(c) Mount the tank on a test platform.

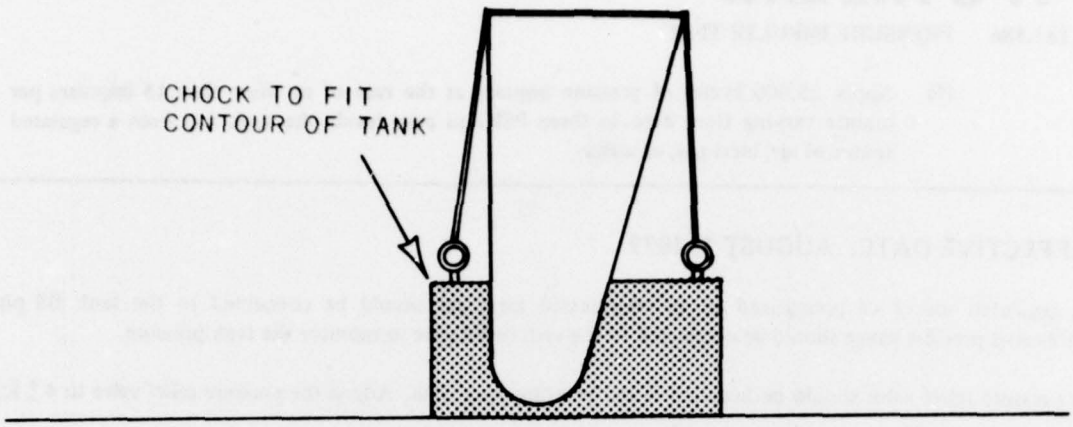
EFFECTIVE DATE: AUGUST 1, 1977

The tank should be mounted similar to an actual installation, and secured in that position.

The fuel tank should include all attachments and fittings as would normally be found on a fuel tank, such as a fuel gauge, fuel feed adapter, etc.

A flat bottomed tank may be mounted directly on the test platform. A tank that doesn't have a flat bottom shall be mounted on chocks cut to fit the contour of the tank under the ends of the tank and under the baffles, if any.

FIGURE 48 - FUEL TANK MOUNTING FOR TESTING



IT'S THE LAW

183.586 PRESSURE IMPULSE TEST

(d) Fill the tank to capacity with water.

EFFECTIVE DATE: AUGUST 1, 1977

If the fuel tank has previously contained fuel it should be purged using water or inert gas. It should be reasonably clean and not contaminated with fuel.

Fill the tank to at least its rated capacity with water. The more water in the tank, the faster will be the test cycle.

IT'S THE LAW

183.586 PRESSURE IMPULSE TEST

(e) Cap and seal each opening in the tank.

EFFECTIVE DATE: AUGUST 1, 1977

After the tank has been filled to rated capacity with water, cap or plug the fuel feed adapter. If a gasoline gauge is not installed, cap this opening. Also seal the fuel fill and vent openings. Some of the openings may be used for piping necessary to conduct the test.

IT'S THE LAW

183.586 PRESSURE IMPULSE TEST

(f) Apply 25,000 cycles of pressure impulse at the rate of no more than 15 impulses per minute varying from zero to three PSIG to zero inside the tank top from a regulated source of air, inert gas, or water.

EFFECTIVE DATE: AUGUST 1, 1977

A regulated source of pressurized air or compressed inert gas should be connected to the tank fill pipe. A calibrated pressure gauge should be connected to the vent or fill pipe to monitor the tank pressure.

A pressure relief valve should be installed in the pressure gauge line. Adjust the pressure relief valve to $4 \pm \frac{0.5}{0.0}$ psig.

A pressure switch with a maximum range of 0 – 20 psig should be installed into the pressure gauge line.

The pressure in the tank should be controlled by a solenoid valve, and a counter capable of recording 25,000 cycles should be tied to the solenoid valve.

In the test the pressure in the fuel tank should vary from zero psig to $3 \pm \frac{0.4}{0.0}$ psig at a rate not to exceed 15 cycles per minute. Zero psig is defined in this test as 0.5 psig or less. The cycle rate will vary depending on the following conditions:

(a) Supply pressure
(b) Air volume in the tank after water is added
(c) Line sizes
(d) Valve sizes, particularly the vent port
(e) Actual pressure settings

NOTE: Any of the above may be varied within reasonable limits to give the desired cycle rate up to the maximum of 15 cycles per minute.

Apply 25,000 cycles of pressure to the fuel tank. It should not leak during or after this test.

IT'S THE LAW

183.586 PRESSURE IMPULSE TEST

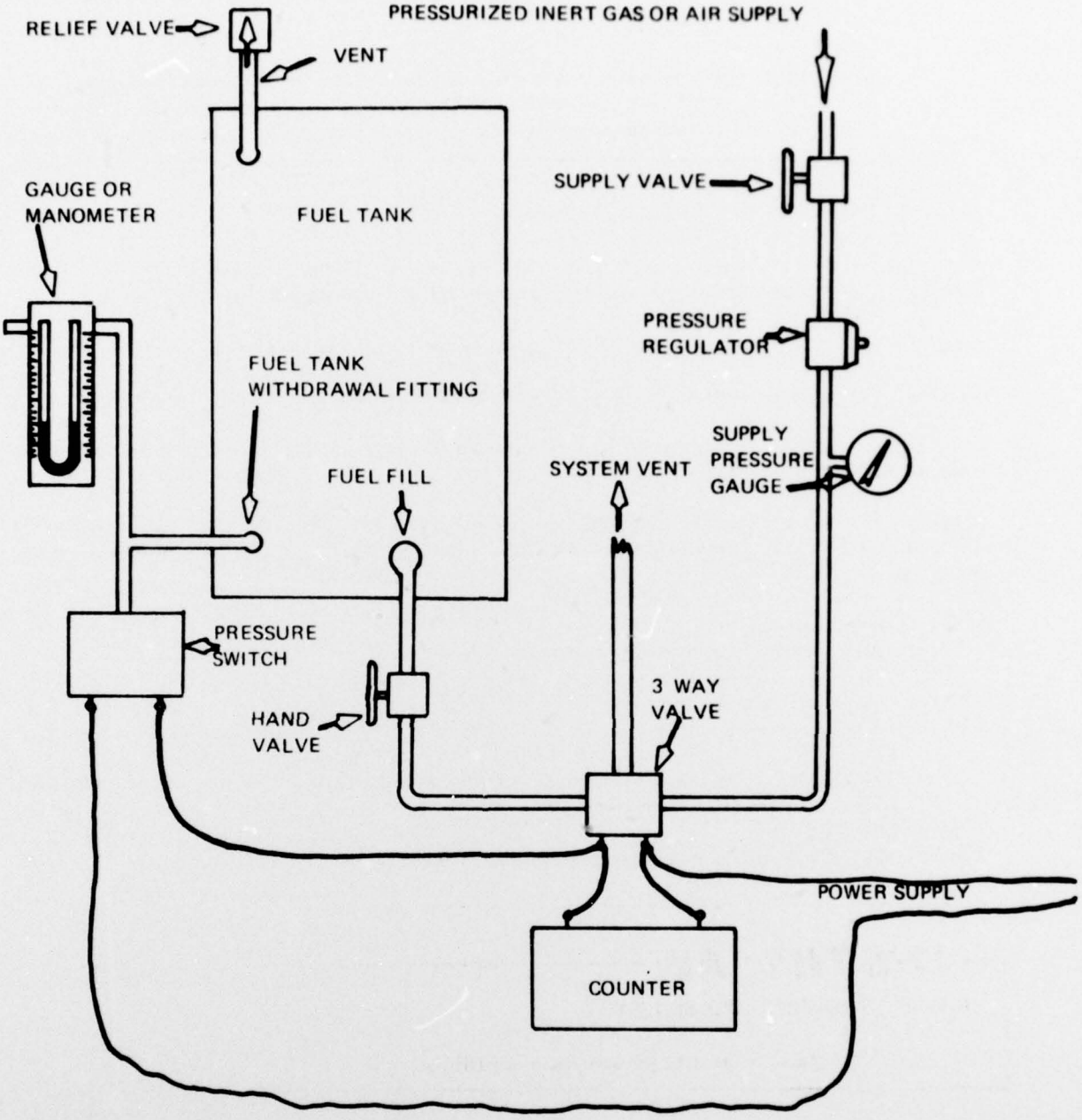
(g) Perform the static pressure test under 183.580.

EFFECTIVE DATE: AUGUST 1, 1977

When the fuel tank completes the cycling of the Pressure Impulse Test, subject it to the Static Pressure Test, as a verification that the tank doesn't leak. If any leakage is found it failed the test.

This test is construed to be a destructive test and a fuel tank subjected to this test should not be installed in a boat.

FIGURE 49 - PRESSURE IMPULSE TEST



CAUTION

The following test procedures are not intended to provide sufficient details to properly conduct the required tests. The information provided is to familiarize the user of this guideline with the objectives of the tests and to diagram in schematic form some of the test considerations.

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Springfield, VA 22151

IT'S THE LAW

183.588 SLOSH TEST

A fuel tank is tested by performing the following procedures in the following order:

(a) Perform the static pressure test under 183.580.

EFFECTIVE DATE: AUGUST 1, 1977

If the tank is 100 gallons or more, and it passed the Pressure Impulse Test in 183.586 then it must be subjected to the Slosh Test.

First, it must pass the Static Pressure Test. This could be the same Static Pressure Test used at the end of the Pressure Impulse Test.

This test is construed to be a destructive test and a fuel tank subjected to this test should not be installed in a boat.

IT'S THE LAW

183.588 SLOSH TEST

(b) Perform the pressure impulse test under 183.586.

EFFECTIVE DATE: AUGUST 1, 1977

In order for a fuel tank to be subjected to the Slosh Test it is first necessary for the fuel tank to have successfully passed the Pressure Impulse Test described in 183.586.

IT'S THE LAW

183.588 SLOSH TEST

(c) Secure the tank to the platform of a tank rocker assembly.

EFFECTIVE DATE: AUGUST 1, 1977

A set-up similar to the Pressure Impulse Test is used, but in addition wood blocks should be mounted to the test platform, forward and aft of the tank to prevent longitudinal movement. Similarly, wood blocks should be mounted to the platform to prevent lateral movement. Straps or clips may be used to prevent vertical movement.

IT'S THE LAW

183.588 SLOSH TEST

(d) Fill the tank to one-half capacity with water.

EFFECTIVE DATE: AUGUST 1, 1977

If the fuel tank has previously contained fuel it should be purged using water or inert gas. It should be reasonably clean and not contaminated with fuel.

Fill the tank to one-half its rated capacity with water.

IT'S THE LAW

183.588 SLOSH TEST

(e) Cap and seal each opening in the tank.

EFFECTIVE DATE: AUGUST 1, 1977

After the tank has been filled to rated capacity with water, cap or plug the fuel feed adapter. If a gasoline gauge is not installed, cap this opening. Also seal the fuel fill and vent openings.

IT'S THE LAW

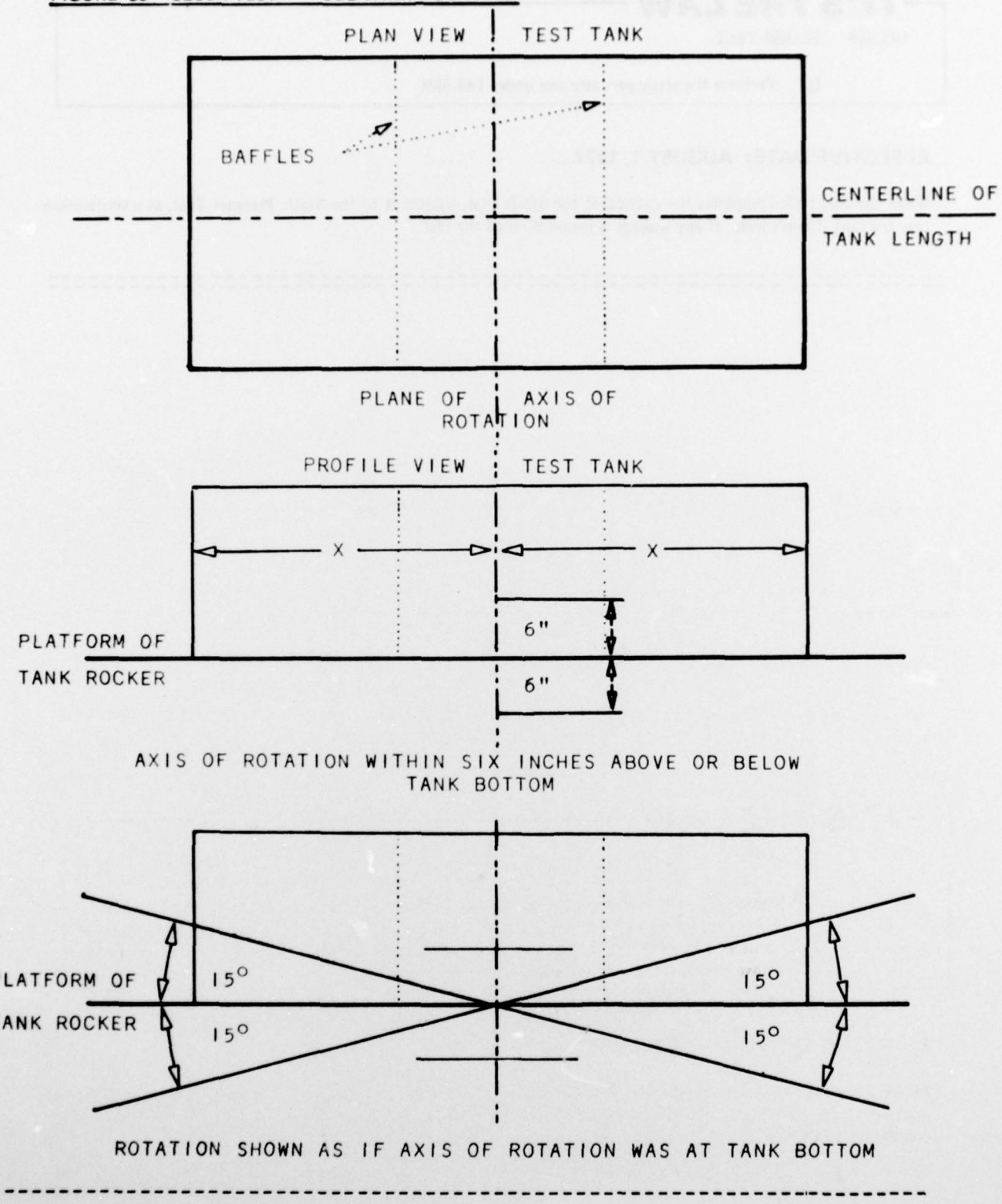
183.588 SLOSH TEST

(f) Apply 500,000 cycles of rocking motion 15 degrees to each side of the tank centerline at the rate of 15 to 20 cycles a minute. The axis of rotation of the rocker and fuel tank must be perpendicular to the centerline of the tank length at a level six inches or less above or below the tank's bottom.

EFFECTIVE DATE: AUGUST 1, 1977

Figure 50 shows how to locate the fuel tank for mounting. The axis of rotation of the test machine is also located in the diagram. The fuel tank is to withstand 500,000 complete cycles. The fuel tank must not leak during or at the completion of the test.

FIGURE 50 - SLOSH TEST – FUEL TANK MOUNTING



IT'S THE LAW

183.588 SLOSH TEST

(g) **Perform the static pressure test under 183.580.**

EFFECTIVE DATE: AUGUST 1, 1977

When the fuel tank completes the cycling of the Slosh Test, subject it to the Static Pressure Test, as a verification that the tank doesn't leak. If any leakage is found it failed the test.

CAUTION

The following test procedures are not intended to provide sufficient details to properly conduct the required tests. The information provided is to familiarize the user of this guideline with the objectives of the tests and to diagram in schematic form some of the test considerations.

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Springfield, VA 22151

IT'S THE LAW

183.590 FIRE TEST

(a) A piece of equipment is tested under the following conditions and procedures:

(1) Fuel stop valves, "USCG Type A" hoses, and hose clamps are tested in a fire chamber.

(2) Fuel filters, strainers, pumps, and carburetors are tested in a fire chamber or as installed on the engine.

(3) Fuel tanks must be tested filled with fuel to one-fourth the capacity marked on the tank in a fire chamber or in an actual or simulated hull section.

(b) Each fire test is conducted with free burning heptane and the component must be subjected to a flame for 2 ½ minutes.

EFFECTIVE DATE: AUGUST 1, 1977

CAUTION: Fire tests can be dangerous particularly using heptane. Heptane is a gasoline type of product that produces a repeatable fire test. Gasolines vary, due to additives, in their heat content and therefore will not uniformly reach a repeatable temperature from test-to-test, heptane will. Precautions must be taken when conducting fire tests to have fire fighting equipment capable of extinguishing Class B (Gasoline and Oil) Fires and personnel experienced in fire-fighting. Typical extinguishing agents are CO_2, Dry Chemical, Foam and Halon. CO_2 is frequently used for testing as there is no residue that could inhibit inspection of the test sample.

It is important that the fire be extinguished quickly at the end of the 2 1/2 minutes so the test sample may be judged at the required time and not subjected to a prolonged fire.

TABLE V

FIRE TEST SELECTION

ITEM	FIRE CHAMBER	ON ENGINE	HULL SECTION
Fuel Tank	X		X
Fuel Stop Valves	X		
USCG Type A Hose	X		
Hose Clamps	X		
Fuel Filter	X	X	
Strainers	X	X	
Fuel Pumps	X	X	

IT'S THE LAW

183.590 FIRE TEST

(c) If the component is tested in a fire chamber –

(1) The temperature within one inch of the component must be at least 648°C sometime during the 2 1/2 minute test;

(2) The surface of the heptane must be eight to 10 inches below the component being tested; and

(3) The heptane must be in a container that is large enough to permit the perimeter of the top surface of the heptane to extend beyond the vertical projection of the perimeter of the component being tested.

EFFECTIVE DATE: AUGUST 1, 1977

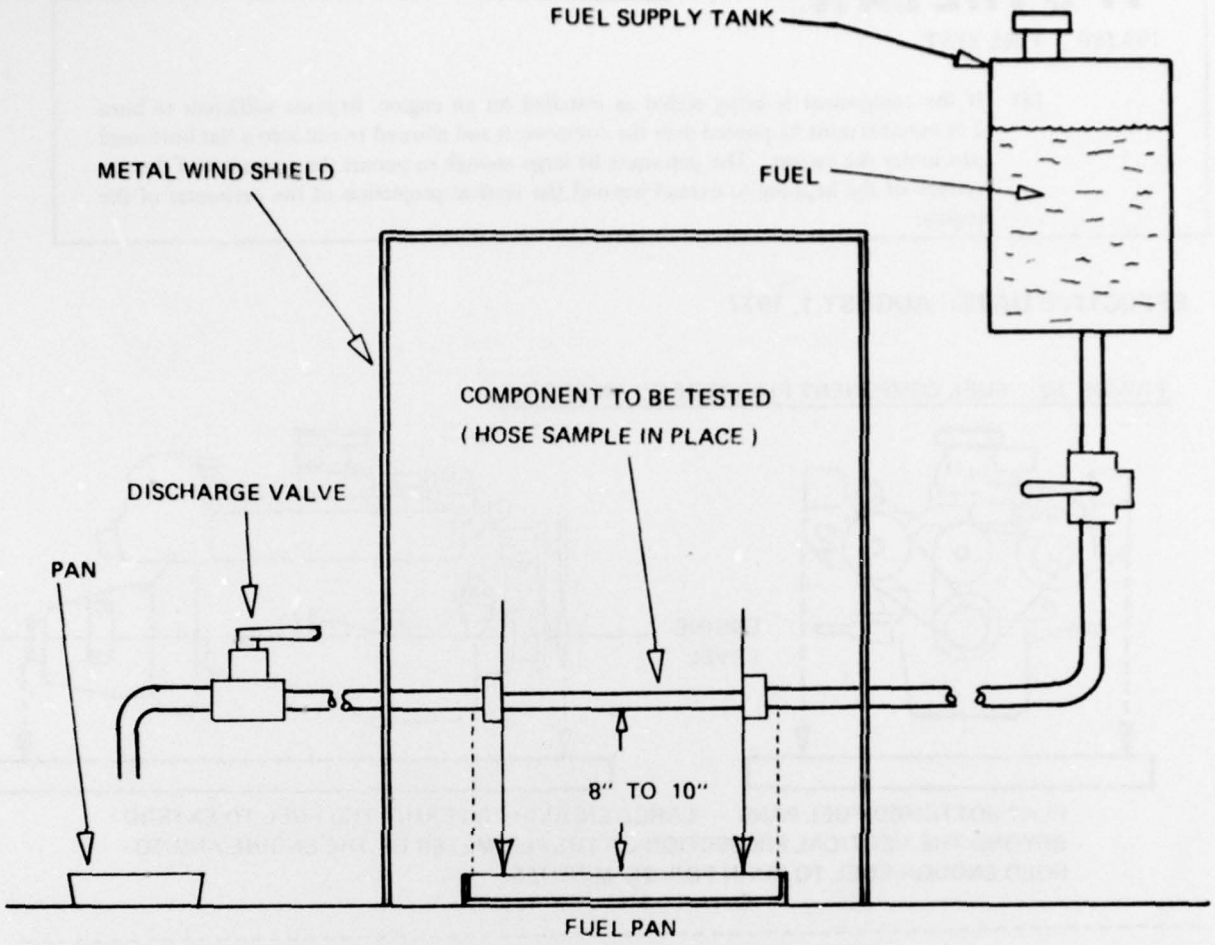
If the component being tested is a hose clamp, after the fire test it must be subjected to a tensile test. It must withstand a 1 pound (0.5 kg) pull in any direction to which it might be subjected in any use. It must not separate, break, crack or noticably deform as a result of the application of the weight used for the test.

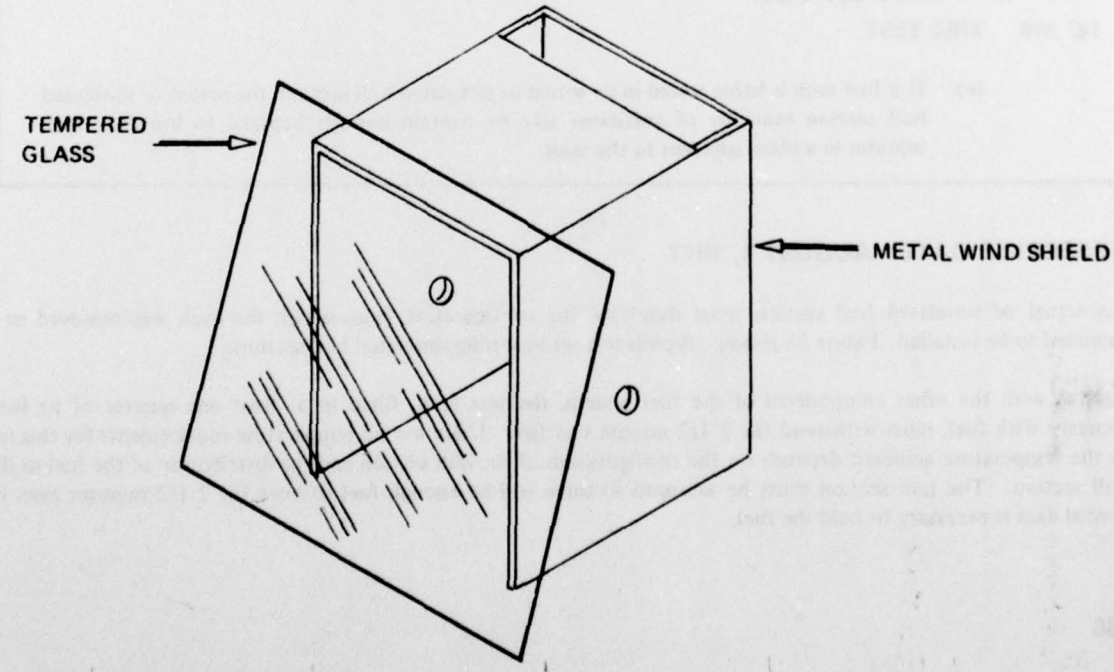
"USCG Type A" fuel hoses and fuel stop valves must not leak fuel after the fire test when subjected to a three foot head of fuel. (See 183.528 and 183.532)

Fuel filters, fuel strainers and fuel pumps must not leak more than 5 ounces of fuel after the fire test, in accordance with 183.524 and 183.534.

All fuel components including fuel tanks tested in a fire chamber must be subjected to a fire that causes the temperature within one inch of the component to reach at least 648°C (1200°F).

FIGURE 51 · FIRE TEST IN A TYPICAL FIRE CHAMBER





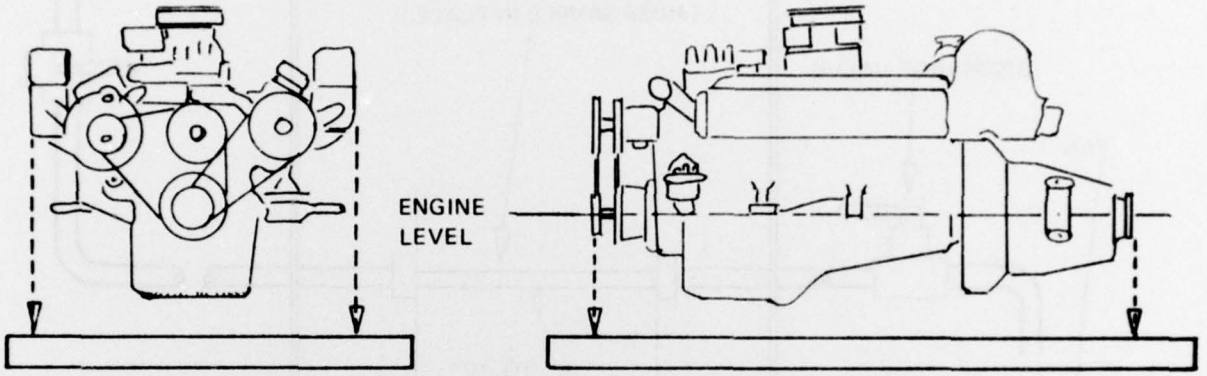
IT'S THE LAW

183.590 FIRE TEST

(d) If the component is being tested as installed on an engine, heptane sufficient to burn 2 ½ minutes must be poured over the component and allowed to run into a flat bottomed pan under the engine. The pan must be large enough to permit the perimeter of the top surface of the heptane to extend beyond the vertical projection of the perimeter of the engine.

EFFECTIVE DATE: AUGUST 1, 1977

FIGURE 52 - FUEL COMPONENT FIRE TEST ON AN ENGINE



FLAT BOTTOMED FUEL PANS -- LARGE ENOUGH TO PERMIT THE FUEL TO EXTEND BEYOND THE VERTICAL PROJECTION OF THE PERIMETER OF THE ENGINE AND TO HOLD ENOUGH FUEL TO BURN FOR 2½ MINUTES.

IT'S THE LAW

183.590 FIRE TEST

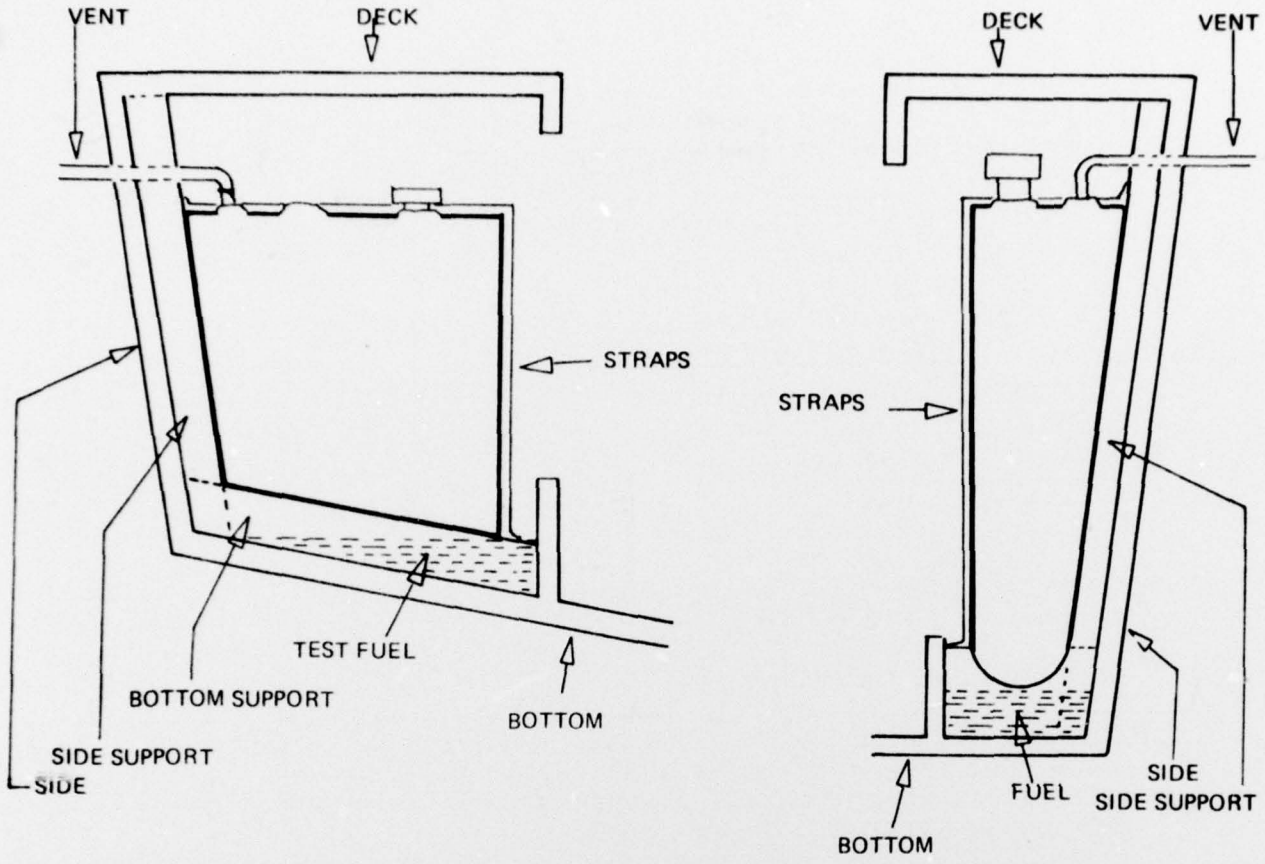
(e) If a fuel tank is being tested in an actual or simulated hull section, the actual or simulated hull section must be of sufficient size to contain enough heptane to burn for 2 ½ minutes in a place adjacent to the tank.

EFFECTIVE DATE: AUGUST 1, 1977

An actual or simulated hull section must duplicate the configuration from which the tank was removed or is intended to be installed. Figure 53 shows typical test set-ups using simulated hull sections.

Just as with the other components of the fuel system, the test tank, filled to at least one quarter of its listed capacity with fuel, must withstand the 2 1/2 minute test fire. There are no temperature requirements for this test as the temperature achieved depends on the configuration of the hull section and the distribution of the fuel in this hull section. The hull section must be arranged so there will be enough fuel to burn for 2 1/2 minutes even if a special dam is necessary to hold the fuel.

FIGURE 53 - FUEL TANK FIRE TEST IN SIMULATED HULL SECTION



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